DEVOTED EXCLUSIVELY TO METALLIC SURFACE TREATMENTS

METAL FINISHING

JUNE, 1952 VOLUME 50 • NUMBER 6

CONTENTS

COMING SOON

A discussion of patent laws as they apply to special processes developed for the metal finishing industry; how to protect them, what they really mean.

Hard chrome plating from room temperature plating baths, including control and operation of the solutions.

A cost system for decorative plating, listing all the items that should be included for accurate analysis of production costs.

An article describing a plant where hard chrome plating of worn diesel cylinder liners are replated and finished.

Founded as Metal Industry, January, 1903
by Palmer H. Langdon, 1868-1935

Editorial and Business Staff

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The WASHINGTON OBSERVER

George W. Grupp

News and Views from The Nation's Capitol

. The Small Business Hardship Account of the NPA has been liberalized to help small firms. Recently 22 New England costume jewelry manufacturers were aided by this account.

. The NPA is being urged to revoke Order M-75 which restricts the sale, delivery, use and inventories of steel shipping drums.

. The R.F.C. has long-term contracts with Belgian Congo, Indonesian and British Malayan tin interests to buy this metal at the rate of $1.215 a pound. Recently tin was selling at $1.17 a pound in Singapore.

. The Defense Production Act will die on June 30th unless Congress extends its life.

. On April 29th the price of lead dropped to 18 cents a pound. This was the first drop in price since January 1, 1951.

. Primary zinc producers have recommended that NPA revoke Zinc Order M-9 because the amount of zinc available exceeds the current rate of consumption.

. The increased flow of copper and brass scrap has resulted in a slight easing of the copper supply situation. This, however, may be offset by current copper strikes.

. The General Electric Co. has offered for non-exclusive license Patent 2,442,223 - a method of improving the corrosion resistance of chromium alloys.

. The specifications for chromium plating of cylinder bores of internal combustion engines have been amended by the Defense Department.

. Governor J. Bracken Lee of Utah has proposed that the Federal Government be stripped of all taxation powers, and that the Federal Government should be supported by assessments against the various states on a per capita income basis.

. Defense military specification P15423A for liquid silver polish has been amended.

ABLISHED 1903

TED EXCLUSIVELY TO METALLIC SURFACE TREATMENTS

METAL FINISHING

UME 50 • NUMBER 6 • JUNE 1952

OFFICE OF THE MAYOR

CITY OF CHICAGO

MARTIN H. KENNELLY
MAYOR

PROCLAMATION

WHEREAS, more than twenty thousand business executives, production supervisors, and research engineers will assemble in Chicago on the sixteenth, seventeenth, eighteenth and nineteenth days of June, 1952, under the auspices of the American Electroplaters' Society, sponsor of the Industrial Finishing Exposition of 1952; and

WHEREAS, nationally prominent scientists in the field of electroplating and government leaders will address the American Electroplaters' Society's 39th Annual Convention at the Conrad Hilton Hotel; and

WHEREAS, a prime purpose of the Industrial Finishing Exposition of 1952 is to inform Chicago's business and industrial leaders of the latest techniques, processes and services in the metal finishing field; and

WHEREAS, the American Electroplaters' Society, through its Exposition and Convention, will add to Chicago's prestige as the nation's outstanding center for metal finishing of all kinds;

NOW, THEREFORE, I, Martin H. Kennelly, Mayor of the City of Chicago, do hereby proclaim the week of June 15 through June 21, 1952 as INDUSTRIAL FINISHING WEEK IN CHICAGO, and recommend and urge that full advantage be taken by our citizens of this opportunity to acquaint themselves with the men, industries and educational institutions responsible for the present high standard of industrial finishing.

Dated this 2nd day of June, A. D., 1952.

Martin H Kennelly

Mayor

A. E. S. TO HOLD 39th ANNUAL CONVENTION AND THIRD INDUSTRIAL FINISHING EXPOSITION CHICAGO, JUNE 16-20

GENERAL PROGRAM

(Central Daylight Saving Time—Used Throughout.)

IN anticipation of those who will arrive in Chicago on Sunday, and to accomodate local members and wives who may wish to register early, the registration desk will be open from 3:00 p.m. until 8:00 p.m., Sunday, June 15th. The *Hospitality Committee* will be waiting there to greet and assist you.

Though Educational Sessions will be held in the *Stock Yards Inn*, and the *3rd Industrial Finishing Exposition* will be in the *International Amphitheater*, General Headquarters for the convention will be the *Conrad Hilton Hotel*, 8th and Michigan.

Transportation by buses, at regular intervals, has been arranged. Early each day buses will begin leaving the Conrad Hilton Hotel. They will arrive at the International Amphitheater and Stock Yards Inn approximately 25 minutes later. There they will unload and take on passengers for the return trip to the hotel. For those who prefer to drive their own cars to the Exposition and Educational Sessions, or wish transportation to other parts of the city, a map of the city marked with convenient routes will be provided in the program book.

The Opening Session and all Social Affairs will be held in the headquarters hotel, the Conrad Hilton. All other meetings, unless otherwise stated, will be held at the *Stock Yards Inn.*

The registration fee of $15.00 will provide each registrant with a book of tickets to the various technical and social events. A convention office located on the third floor of the Conrad Hilton Hotel will be open from 9:00 a.m. to 5:00 p.m. for the convenience of visitors.

Cleveland F. Nixon
Supreme President

Even in the matter of presenting the technical program, Chicago will be living up to its reputation of "always something new." This year a different method of presenting the technical papers will be tried in the interests of promoting efficient utilization of the busy conventioneers' time.

On Monday and Tuesday the papers will be presented in dual sessions running concurrently. The papers will be split up into two groups appealing to different interests; each group will be presented in a different room simultaneously. In this way the technical man can choose just those papers in which he is particularly interested. It also enables the presentations of more papers covering the broad range of interests of members of the Society, while leaving plenty of time for visiting and study of the many exhibits which will be displayed in the Stockyard Arena, which is an education in itself.

Single technical sessions only will be held on Wednesday and Thursday.

Abstracts of these papers will be found on page 91.

Sunday, June 15

1:00 p.m.

CONRAD HILTON HOTEL

Chicago Electroplaters' Institute — Brunch and Meeting — For members only.

2:00 p.m.

CONRAD HILTON HOTEL

Metal Finishing Suppliers' Association, Inc. Board of Directors' Meeting.

3:00 p.m.

3rd FLOOR — CONRAD HILTON HOTEL

Registration until 8:00 p.m.

Monday, June 16

8:00 a.m.

3rd FLOOR — CONRAD HILTON HOTEL

Registration all day.

10:00 a.m.

GRAND BALLROOM — CONRAD HILTON HOTEL

Opening Session—Attended by both the men and their ladies.

Invocation—The Reverend *Frank Mesle*, Oneida.

Franklyn J. MacStoker
1st Vice-Pres.

Dr. George P. Swift
2nd Vice-Pres.

Dr. Ralph Schaeffer
3rd Vice-Pres.

Dr. Donald G. Foulke
Exec. Sec'y.

William J. Neill
Past President

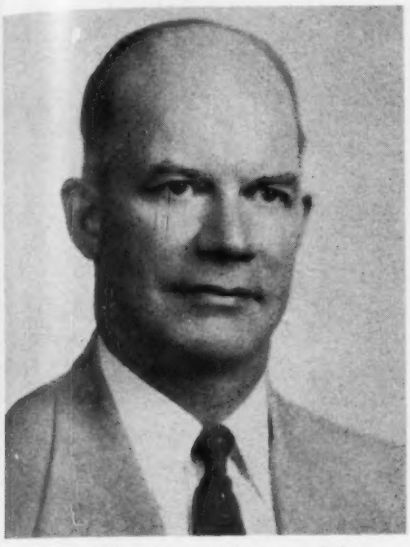
Greetings from the Chicago Branch—*Raymond F. Ledford*, President.

Welcome to Chicago—*Clyde Kelly*, Chairman.

Drawing for the Queen of the Convention and her two attendants.

Greetings from the A.E.S. President—*Mr. Cleveland F. Nixon.*

Keynote Address—*Michael DiSalle*, former Price Administrator.



Clyde Kelly, *General Chairman of the 1952 A.E.S. Convention*

11:30 a.m.

CONRAD HILTON HOTEL

Business Meeting—delegates only.

12:00 Noon

CONRAD HILTON HOTEL

International Fellowship Club—28th Annual Luncheon — For equipment and supply manufacturers, Distributors and their Representatives.

12:30 p.m. until 10:00 p.m.

INTERNATIONAL AMPHITHEATER

The Third Industrial Finishing Exposition opens.

12:30 p.m.

LITTLE GALLERY—STOCK YARDS INN

Speakers Luncheon.

1:00 p.m.

CONRAD HILTON HOTEL

Metal Finishing Suppliers' Association, Inc. 1st Annual Business Meeting for suppliers and representatives.

2:00 p.m.

1st FLOOR BALLROOM—STOCK YARDS INN

Technical Session "A"—Chairman, *R. Wysong*, Bendix Aviation Corp., South Bend, Ind.

2:00 p.m.

SADDLE & SIRLOIN CLUB BALLROOM

STOCK YARDS INN

Technical Session "B"—Chairman, *Vincent Mattacotti*, Milwaukee Plating Co., Milwaukee, Wis.

8:30 p.m.

GRAND BALLROOM—CONRAD HILTON HOTEL

Open House Party—A night of informal gaiety and good fellowship, through the courtesy of our good friends the Metal Finishing Suppliers' Association, Inc.—Refreshments - Music - Dancing - Buffet (served at 10:00 p.m.).

Crowning of the Convention Queen—By *A. P. Munning*, President MFSA.

Tuesday, June 17

7:45 a.m.

LIPTON ROOM—STOCK YARDS INN

Branch Secretaries Breakfast.

7:45 a.m.

FOUNDERS HALL—STOCK YARDS INN

Fund Raisers Breakfast.

8:00 a.m.

LITTLE GALLERY—STOCK YARDS INN

Speakers Breakfast.

9:00 a.m.

INTERNATIONAL AMPHITHEATER

Third Industrial Finishing Exposition. Open until 5:00 p.m.

9:00 a.m.

3rd FLOOR — CONRAD HILTON HOTEL

Registration — until 12:00 Noon — Banquet Table Reservations.

9:00 a.m.

International Fellowship Annual Golf Tournament. See MFSA Section for complete details.

9:00 a.m.

1st FLOOR BALLROOM—STOCK YARDS INN

Technical Session "A"—Symposium on "Materials of Construction"—Chairman, *Frank L. Clifton*, General Motors Research Laboratories, Detroit, Michigan.

Marion Longfield

General Co-chairman

9:00 a.m.

SADDLE & SIRLOIN CLUB ROOM

STOCK YARDS INN

Technical Session "B"—Chairman, *Dr. M. M. Beckwith*, Harshaw Chemical Co.

12:30 p.m.

FOUNDERS HALL—STOCK YARDS INN

National Association of Metal Finishers—Luncheon and Meeting—*John Hilfinger*, Toledo, Ohio, Presiding.

TUESDAY EVENING FREE

Wednesday, June 18

8:00 a.m.

LITTLE GALLERY—STOCK YARDS INN

Speakers Breakfast.

R. J. Hazucha

Entertainment Chairman

Harold Smallman

Hotel Co-Chairman

W. O. Zinn

Plant Visitation

J. M. Andrus

Educational

Dr. J. H. Monaweck

Finance

R. F. Ledford
Publicity

Harold Faint
Registration

Harry Hansen
Branch Exhibits

Dr. H. J. Weisner
Chairman of Research Exhibit

8:00 a.m.

3rd Floor — Conrad Hilton Hotel

Registration—Until 12:00 Noon—Please exchange your Banquet Ticket for Table Reservations.

9:00 a.m.

1st Floor Ballroom—Stock Yards Inn

Technical Session—Chairman, *R. E. Pettit*, Thrift Etching Corp.

12:00 Noon

International Amphitheater

Third Industrial Finishing Exposition—Until 10:00 p.m.

12:30 p.m.

Conrad Hilton Hotel

Research Committee—Luncheon and Meeting For Members Only.

2:30 p.m.

Grant Park —opposite

Conrad Hilton Hotel

Soft Ball Game—East vs. West—Full Details Will be Available at Convention Time.

WEDNESDAY EVENING FREE

Thursday, June 19

7:45 a.m.

Lipton Room—Stock Yards Inn

Research Committee Breakfast.

8:00 a.m.

3rd Floor—Conrad Hilton Hotel

Registration—Desk open until 12:00 Noon for final Banquet Table Reservations.

9:00 a.m.

International Amphitheater

Third Industrial Finishing Exposition—Until 5:00 p.m.

9:00 a.m.

1st Floor Ballroom—Stock Yards Inn

Technical Session—Report on A.E.S. Research Program—Chairman, *Dr. Walter L. Pinner*, Houdaille-Hershey Corp.

2:00 p.m.

Conrad Hilton Hotel

Final Business Meeting—American Electroplaters' Society—*C. F. Nixon* Presiding.

7:00 p.m.

North Ballroom—Conrad Hilton Hotel

Annual Banquet—Fine Food - Good Music - Fine Entertainment - Dancing - Drawing for *Hanson - Van Winkle - Munning Co.'s* Prizes.

TECHNICAL PROGRAM

MONDAY — JUNE 16

2 p.m. Session A — First Floor Ballroom — Stockyard Inn

Technical Chairman — *Ralph Wysong* — Studebaker Corp., South Bend, Ind.

1—Improved Plating and Anodizing with Decationized Chromic Acid Solutions
Floyd Kahler & Lloyd Gilbert — Rock Island Arsenal
W. S. Morrison — Illinois Water Treatment Co.

2—Engineering Aspects of Waste Prevention
D. Milne — General Motors Corp.

3. Filtration—Theoretical and Practical
Harold Faint — Industrial Filter & Pump Co.
R. Scott Modjeska — Scientific Control Labs.

2 p.m. Session B — Saddle & Sirloin Club Ballroom — Stockyard Inn

Technical Chairman — *Vincent Mattacotti*, Milwaukee Plating Co., Milwaukee, Wisc.

1—Heavy Rhodium Plating
Harold Weisner — Bendix Aviation Corp.

2—Film — *"Visit to the Westinghouse Electroplating Projects Laboratory"*
George Jernstedt — Westinghouse Corp.

3—An Explanation of Black Nickel Plating
Walter R. Meyer — Enthone, Inc.

TUESDAY — JUNE 17

9 a.m. Session A — First Floor Ballroom — Stockyard Inn

Technical Chairman — *Frank Clifton* — General Motors Corp., Detroit, Mich.

1—Plastics as Plating Room Engineering Materials
D. Gardner Foulke — Exec. Sec'y, American Electroplaters Society

2—Materials of Construction for Plating Rooms
Dr. Russell Harr, Weston Elec. Co.

3—Materials of Construction for a Waste Water Treatment System
Fred Brune — Chrysler Corp.

Dr. H. A. Gilbertson
Advisory Chairman for 1952 Convention

Leonard Weeg
Rockford Branch
Co-Operating Committeeman

Ralph Wysong
St. Joseph Valley
Co-Operating Committeeman

Vincent Mattacotti
Publicity Chairman

William Geissman
Co-Operating Committeeman

9 a.m. Session B — Saddle & Sirloin Club Ballroom — Stockyard Inn

Technical Chairman — *M. M. Beckwith* — Harshaw Chemical Co., Cleveland, O.

1—Vacuum Metallizing Today
J. Gordon Seiter — F. J. Stokes Mach. Co.

2—Current Distribution in Barrel Plating — A Statistical Study
W. Geissman

3—White Brass Plating
R. B. Saltonstall — The Udylite Corp.

NO AFTERNOON TECHNICAL SESSIONS — VISIT THE EXHIBITS IN THE STOCKYARDS ARENA

WEDNESDAY — JUNE 18

9 a.m.

Technical Chairman — *R. E. Pettit* — Chicago Thrift Etching Co., Chicago, Ill.

1—A Critical Review of Substitute Finishes
Myron Ceresa — Westinghouse Elec. Corp.

2—Hard Coatings on Aluminum
Frank Keller — Aluminum Co. of America

3—Instrumentation in the Plating Room
Frank Savage — Savage-Rowe Plating Co.

NO AFTERNOON TECHNICAL SESSIONS — VISIT THE EXHIBITS

THURSDAY — JUNE 19

9 a.m.

Technical Chairman — *Walter Pinner* — Houdaille-Hershey Corp., Detroit, Mich.

1—Benefits to the Plater of the A.E.S. Research Program
E. J. Serfass — Lehigh University

2—Practical Aspects of the Atomizer Test
Henry Linford — Columbia University

3—Engineering and Economic Aspects of Cyanide Waste Treatment
B. F. Dodge — Yale University

AFTERNOON — ANNUAL BUSINESS MEETING OF THE A.E.S.

ABSTRACTS OF PAPERS

Improved Plating and Anodizing with Decationized Chromic Acid Solutions

By *Floyd Kahler, Lloyd Gilbert* and *W. S. Morrison*

The paper discusses the use of the cationic ionexchange method of removing contaminating metal ions from hard chromium plating and anodizing solutions. Operating data obtained at Rock Island Arsenal are presented and the advantages gained in the plating and anodizing processes are reported.

Engineering Aspects of Waste Prevention

By *David Milne*

This paper outlines the trend from overall treatment of waste liquids to recovery and concentration of the metals and materials formerly wasted. The change in thinking on industrial waste control is emphasized and the practices and equipment developed to prevent waste of expensive solutions and eliminate or minimize waste treatment facilities is outlined. Examples are drawn from operating installations and present figures are presented showing the actual savings experienced.

Filtration—Theoretical and Practical

By *Harold Faint* and *R. Scott Modjeska*

The first portion of this paper deals with the theoretical concepts of filtration, filter designs, filtration media, caking materials, and nature of extractables. This is followed by a discussion of materials of construction for specific applications which then leads to the practical use of specific types of filters for specific problems and trouble shooting in filtration systems.

Some Experiences in Heavy Rhodium Plating

By *Harold J. Wiesner*

A short review of previous work on rhodium plating is given as well as the properties of rhodium. Studies of the effects of metal concentration, temperature, acidity, current density upon rate of deposition of two types of rhodium baths are presented. Effects of impurities and methods of purification are outlined. Methods of control of the bath constituents are discussed. Experience in operating rhodium baths over several months time on a semi-production basis are related.

A Visit to the Electroplating Projects Laboratories of Westinghouse

Dialogue and Photography By
George W. Jernstedt

This is a colored film with sound accompaniment on magnetic tape showing the type of construction of these laboratories, the various tank arrangements, and examples of the plating research carried out along with the facilities available.

Ed Stanek
Sergeant-at-arms

Klem Petrosius
Program

Elmer Olson
Transportation

Frank Clifton
Session Chairman

An Explanation of Black Nickel Plating

By *Earl J. Serfass, Ralph F. Muraca* and *Walter R. Meyer*

An explanation of the mechanism of black nickel electroplating is presented, as well as of immersion blackening of zinc, iron and other metals in solutions containing thiocyanate and thiosulfate. Thermodynamic calculations are given to indicate that thiocyanate and thiosulfate ions are reduced to sulfide ions either electrically or by metal dissolution. The mechanism of the reaction and the reason for the use of zinc ions and ammonia are discussed.

Plastics as Plating Room Engineering Materials

By *D. Gardner Foulke*

The use of plastics in the plating room is discussed, with particular reference to new applications, and materials. The limitations of certain types of plastics and the precautions which should be taken with respect to their use are reviewed. Examples of the newer developments in this field will be shown.

M. M. Beckwith
Session Chairman

Materials of Construction for Plating Rooms

By *Russel Harr*

The materials of construction used for the floors and the drainage system are discussed. In the latter case the system is divided to provide for the segregation and batch treatment of water containing cyanides and water containing acid and alkali. Piping systems employed for the transfer of large amounts of acid, liquid caustic and de-ionized water are described. Exhaust duct construction is explained along with the steps taken to protect ducts and fans from corrosion. Tank materials are discussed.

Materials of Construction for Waste Water Treatment System

By *Fred J. Brune*

The materials used in the construction of a plating waste water treatment system are described and the reason for the selection in each case is given. An evaluation of the materials after two years operation presented. The discussion covers sewer lines to the receiving sumps, transfer to reaction tanks and thence to secondary treatment and classification unit and finally to the point of discharge in a public stream.

Vacuum Metallizing Today

By *J. Gordon Seiter*

The process of vacuum metallizing is defined and the applications for which the technique is useful are described. The metals that can be deposited by this method and the materials that can be coated are considered. A description of the operating procedures required, including pre-and post treatments is presented.

Current Distribution in Barrel Plating —A Statistical Study

By *William Geissman.*

This paper is a progress report on a study being made of the variance of deposit thickness encountered in a given load coming from a plating barrel. Statistical methods are applied to the measurements obtained for each load and the principles involved in statistical methods are discussed.

White Brass Plating

By *R. B. Saltonstall*

The author first presents a brief historical background of white brass plating, then discusses solution composition, operating data, equipment requirements, and the effect of variables on the composition of the alloy deposit. Characteristics of the deposit, solution control, preliminary coatings, available corrosion data and uses are also discussed.

A Critical Review of Substitute Finishes

By *Myron Ceresa*

A critical review is presented of the metallic finishes available during the present period of shortages. The difficulties that have been encountered with substitute finishes are discussed and examples are given of items plated with such finishes. Base

Walter Pinner
Session Chairman

metal preparation, plate thickness and post-treatment of the plated surface are discussed. Solutions to some of the production problems arising from finish changes are reviewed.

Hard Coatings on Aluminum

By *F. Keller*

The characteristics of newly developed hard coatings on aluminum are presented. The mechanism by which these coatings are formed on different alloys and the relationship between thickness and the hardness of the coatings are discussed. The processes in present use are described.

Instrumentation in the Plating Room

By *Frank Savage*

The details of automatic pH Control and electronic devices for the control of solution level are described. The use of conductivity measuring instruments to indicate boiler feed-water contamination is discussed as well as unusual instrument uses for ordinary plating operations.

(*Concluded on page* 102)

R. E. Pettit
Session Chairman

METAL FINISHING SUPPLIERS ASSOCIATION PROGRAM

IN a recently published article the remark was made that the supply houses in the metal finishing industry were expected to have the "wisdom of Solomon, the patience of Job, and the wealth of Croesus."* Whether or not they fulfill these qualifications, it is certain that at Annual Convention time they do display the generosity of Santa Claus' summer cousin, for a convention without the various Fellowship affairs would be like Thanksgiving without turkey and trimmin's.

The support of A. E. S. activities by the industry's manufacturers and distributors is extensive throughout the whole year, but is especially evident and instrumental in the success of each year's annual meeting.

A. P. Munning
President, Metal Finishing Suppliers Ass'n

The first affair sponsored by the Metal Finishing Suppliers' Ass'n. takes place at noon on Monday, the first day of the Convention, in the form of the annual International Fellowship Luncheon. This is open only to representatives of supply houses, and all firms selling to the metal finishing field are urged to have someone present for this meeting. It gives an excellent opportunity for a friendly and informal gathering with other suppliers and competitors where mutual problems can be discussed openly. At the business meeting, which follows immediately after the luncheon, there will be held the election of officers and discussion of the proposed By-Laws of the Association.

In the evening on Monday the MFSA will again sponsor its gala Fellowship Open House Party, open to all registrants. Veteran conventioneers will tell you to put a big red circle around this event on your program, for it is the opening gun in the week's social festivities. Refreshments, dancing, entertainment, and fun galore are positively guaranteed. If you don't have the time of your life at this affair you might as well go back home and make out your will.

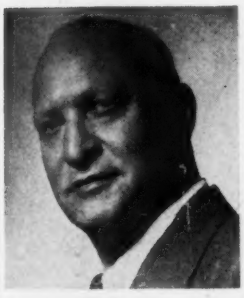
Joe Duffy
Golf Chairman

This year's annual Fellowship Golf Tournament will really separate the men from the boys, coming as it will on the morning *after* the Open House Party. Keep your eye on any golfers sneaking off to bed early from the party — they're the ones who will be making a strong bid for the beautiful Fellowship Golf trophy at the Nordic Hills Country Club, in nearby Itasca on Tuesday morning. We understand that the golf committee has a plan to foil the party-poopers, however. The idea is to have a testing device on the first tee that will check the alcoholic content of the breath. A test will be made on each player, and anyone found deficient will have to make it up before being allowed to tee off. It hasn't been revealed yet whose breath will be used to set the top calibration for the machine!

Golfers are requested to bring their own clubs and shoes. Remember—last year's handicap winner had a snappy 151 gross, so anyone has a chance. (Wonder if *Joe Eiselle*, last year's low-gross winner, is much of a party man?) Anyway, the long list of beautiful and useful prizes will be well worth the effort involved.

After the golf tournament is over, the MFSA leaves you on your own for the balance of the week, with the gentle suggestion that attendance at the technical sessions would not only be helpful to you, but would cause them a lot less grief in keeping your production going all year long.

OFFICERS OF THE METAL FINISHING SUPPLIERS ASS'N



Al Braun
1st Vice-Pres.

Chas. Berry
2nd Vice-Pres.

Manson Glover
3rd Vice-Pres.

Tom Trumbour
Permanent Sec'y.

George L. Nankervis
Past Pres.

*See "People and Industry," *Metal Finishing*, May 1952.

Convention Ladies To Have A Full Program

LADIES COMMITTEE

Left to Right—Standing: Miss Irene Donnelly, Miss Mary Loftus, Mrs. Harold Faint, Mrs. Marion Longfield, Mrs. Orville Kocour and Mrs. Paul Glab. Seated: Mrs. Elmer Olson, Mrs. Edward Stanek, Mrs. Edward Stack, Mrs. Ray Ledford and Mrs. Cyril Kocour.

A GLAD "Hello" to old friends and new will be in order at the exclusive Ladies North Assembly Room on the third floor of the Conrad Hilton Hotel during the 39th Annual A. E. S. Convention.

The ladies committee, headed by *Mrs. Marion Longfield*, has arranged to have a limited number of tickets for many of the interesting and entertaining features in Chicago at the time of the convention. Should you care to attend any of these features, such as radio or television broadcasts open to the public, make your request known as soon as possible to the ladies committee.

A full program has been arranged to insure a memorable visit, starting with the convention's opening session on Monday morning with a general interest talk by a prominent international speaker. A new event for the ladies will be the drawing of tickets to determine a "Queen" and her two attendants. This should add color and glamorize the entire program. Monday afternoon will feature a Tea and Style Show in the Narcissus Room at *Marshall Field and Company*, one of the world's great stores. In the evening will be held the well known Fellowship "Open House," in the Grand Ballroom of the Hotel, given by the *Metal Finishing Suppliers' Association*. At this affair the convention Queen will be crowned.

Scenes at the various tables during the Ladies Technical Session, held in Buffalo last year, at which time the "mysteries" of electroplating were explained by Dr. Saltonstall, Udylite's Technical Director. The ladies were Udylite's guests at this event.

Ladies Program

Headquarters North Assembly Room—Conrad Hilton Hotel 3rd Floor

Sunday, June 15

3:00 p.m.

Registration—3rd Floor.

Monday, June 16

8:00 a.m.

Registration All Day—3rd Floor.

10:00 a.m.

GRAND BALLROOM

Opening Session—Ladies will join the men. Before the close a drawing for the Queen of the Convention will be held. Three tickets will be drawn, the first for the Queen, and the following two for her two

attendants. These ladies must be present at time of drawing and must be over 16 years of age.

3:10 p.m.

Transportation to Marshall Field & Company. 8th Street Entrance.

3:45 p.m.

NARCISSUS ROOM

Tea—Style Show conducted by Field's Eminent Stylist—Marshall Field & Company. Hostesses—*Mrs. Ray Ledford, Mrs. Harold Faint, Mrs. E. F. Stack, Mrs. Wm. Geissman.*

8:30 p.m.

GRAND BALLROOM

International Fellowship Club—Open House Party—(Courtesy of Metal Finishing Suppliers' Association, Inc.)—Music - Dancing - Buffet Supper—Crowning of the Convention Queen.

Dave X. Clarin

Tuesday, June 17

11:45 a.m.

Aunt Ella Society Garden Party Luncheon (Courtesy of Oakite Products, Inc.) McKinlock Gardens—Art Institute of Chicago—Host: *David X. Clarin* (Aunt Ella).

2:30 p.m.

Talk on Exhibits of China, Paintings, and other Art Objects, Fullerton Hall—Art Institute of Chicago.—Hostesses: *Mrs. Ray Ledford, Mrs. Paul Glab, Mrs. Elmer Olson, Mrs. Ralph Wysong.*—Following the Talk the Ladies are Free to Roam the Galleries.—Please remind your friends and husband to make Banquet Table Reservations.

Wednesday, June 18

GRAND BALLROOM

10:00 a.m.

Plato Party—Prizes, and Lots of Fun. Hostess: *Mrs. Joan T. Wiarda.*

12:30 p.m.

Luncheon—in the Famous Boulevard Room.

Joan T. Wiarda

2:00 p.m.

Monologue—By *Sulie Harand*, well known impressionist.—Hostesses: *Mrs. Orville Kocour, Mrs. Cyril Kocour, Mrs. Harold J. Weisner, Mrs. Edward Stanek, Mrs. Edward F. Stack.*

Thursday, June 19

9:30 a.m.

Transportation to Exposition—Educational Session and Luncheon—8th St. Entrance.

10:00 a.m.

Visit—3rd Industrial Finishing Exposition International Amphitheater.

11:00 a.m.

Educational Session and Luncheon—Saddle and Sirloin Club Room of Stock Yards Inn. "How Detergents Take The Rubbing Out of Scrubbing"—*Mr. Gerald A. Lux*, of Oakite Products, Inc. will present a non-

Gerald A. Lux

technical, informal talk on the various types of detergents, illustrating the more technical points with a few demonstrations.—Hostesses: *Mrs. Paul Glab, Miss Mary Loftus, Mrs. Elmer Olson, Mrs. Edward Stanek, Mrs. Ralph Wysong, Miss Irene Donnelly.*—Closing of the Ladies Program: Goodbye to the Queen—Hello to *Mrs. Mary F. Robson*, Chairman of the Ladies' Committee for the 1953 Convention to be held in Philadelphia.

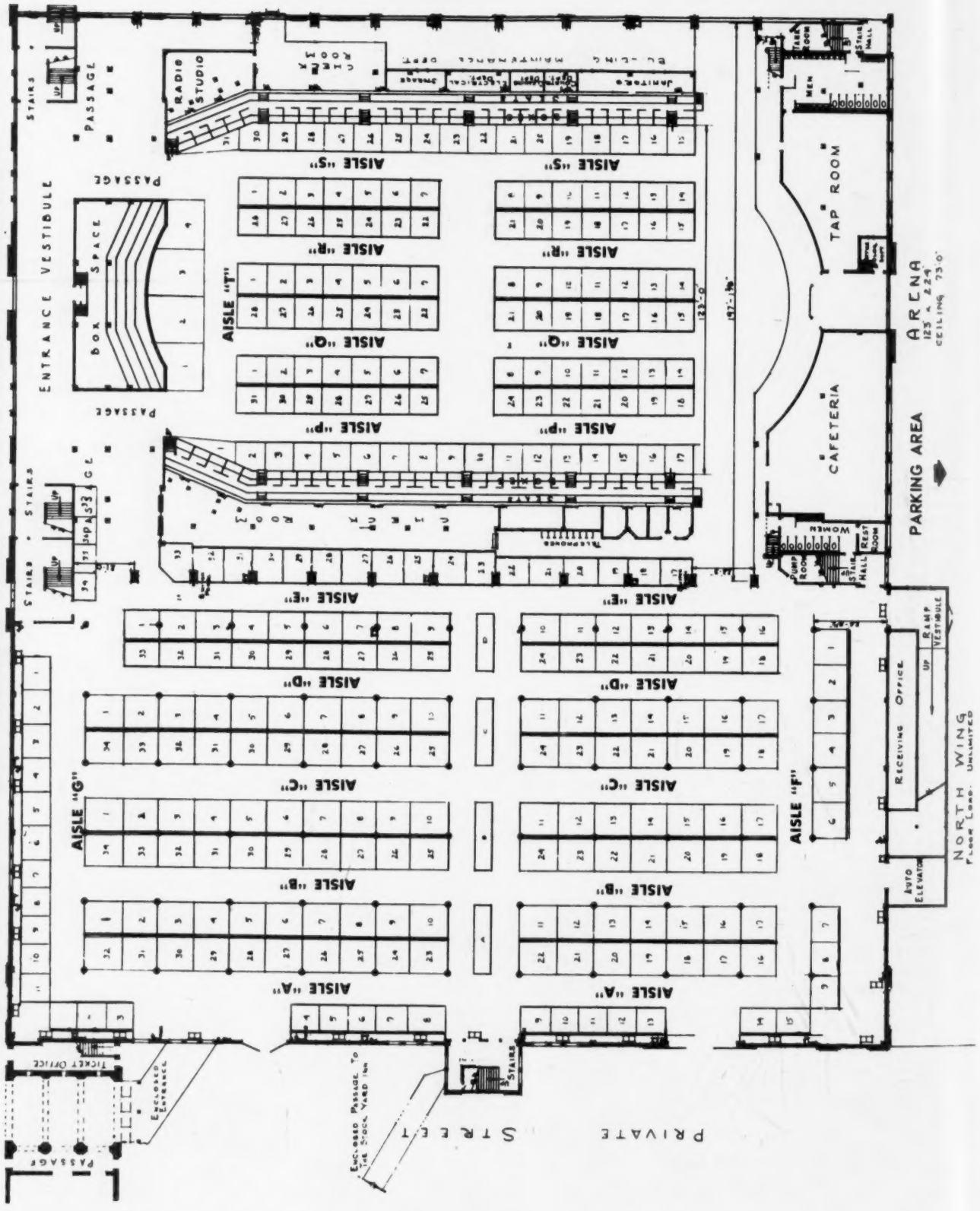
7:00 p.m.

GRAND BALLROOM

Annual Banquet and Ball—A Night of Fun. Good Food and Fine Entertainment—Drawing for Hanson-Van Winkle-Munning Prizes.

Farewell good friends, both old and new.
We've been so glad to Welcome you.
So sorry now to say Goodbye,
But, we'll see you in Philly by and by.

FLOOR PLAN FOR INDUSTRIAL FINISHING EXHIBITS



INDUSTRIAL FINISHING EXHIBITORS

Following is a complete listing of exhibitors of equipment and supplies, together with the booth numbers and the names of persons who will be in attendance at the booths during the Industrial Finishing Exposition.

Acme Mfg. Co. **D-11, 12, 13**
1400 East Nine Mile Road, Detroit 20, Michigan.
George R. Carlson, Arthur Losey, Robert Wesler.
Acme 66" Combination seven-station indexing and 21 spindle continuous Rotary Automatic Polishing and Buffing Machines. Automatic and semi-automatic polishing and buffing machinery.

Admiral Engineering Corp. **A-7**
900 W. Erie Street, Chicago, Illinois.

Agri-Indus Mfg. Co. **G-7**
1327 Huntington Bank Bldg., Columbus, 15, Ohio.

Allied Research Products, Inc.....**S-19-20**
4004-06 East Monument Street, Baltimore, Maryland.
H. C. Irvin, President; C. W. Ostrander, Service Manager; L. C. Kingsbury, Vice President; R. H. Hoffman, Director of Research; R. C. Strickler, Development Engineer; A. L. Poe, Dist. Sales Manager; L. F. Richard, Dist. Sales Manager; J. A. Cairas, Dist. Sales Manager; L. C. Camill, District Sales Manager; J. C. Baker, Distributor; Gene Conrot, Distributor; John Schneider, Agent; Hal Johnson, Distributor; Clem Hohner, Agent.
Iridite finishes for corrosion protection and paint adherence on zinc, cadmium, aluminum, copper, brass, bronze. ARP brighteners for zinc and cadmium plating solutions.

Almco, Division of Queen Stove Works, Inc. **E-15, 16**
Alberta Lea, Minnesota.
R. C. Trow, Vice President, General Manager; N. L. Watkins, Director of Sales; R. F. Wuerfel, Branch Manager; R. M. Krieger, Chicago Sales Engineer; O. D. Ladley, Sales Engineer; Don C. Johnson, Sales Engineer.
Almco Supersheen submerged finishing barrel. Almco Supersheen "Twin" finishing barrel. Advanced Design Series Finishing Barrel. Hoist Pan. Multi-purpose Hoist. Hopper Unit. Portable Screening Unit. Permanent Screening Unit. Complete line of Chips and compounds.

American Buff Co. **Q-15, 16, 17**
2414 South La Salle Street, Chicago 16, Illinois.
Ben P. Sax, President; Stanley P. Sax, Vice President; Harry Pink, Service Engineer; Edward W. Hoyle, Service Engineer; Leonard B. Sax, Secretary-Treasurer; Marvin Radom, Service Engineer; Ernest Reichenberg, Eastern Division Manager.
Automatic Centerless Bias Buffs. Pre-Assembly for Automatic Centerless Buff. All types of buffs and polishing wheels.

American Electroplaters' Society..**B-4-5-6**
Research Program.

American Rack Co.
(See Imperial Rack Co.)

American Society for Metals **A-22**
7301 Euclid Ave., Cleveland, O.
A. P. Ford, Sales Mgr., Metal Progress; Taylor Lyman, Publisher, Metal Progress; R. H. Cromwell, Chicago Mgr., Metal Progress.
Metal Progress Magazine. Material on National Metal Exposition.

Americana Corporation **P-13**
333 North Michigan Avenue, Chicago, Illinois.
Lorraine Eastman, Armin Eastman, Director, Exhibit Sales.
Encyclopedia Americana—Thirty Volumes; Book of Knowledge—Twenty Units—Bound in ten covers.

Ashdee Products, Inc. **S-2, 3, 4**
18029 Dixie Highway, Homewood, Illinois.
A. C. Walberg, President; John Bapes, Vice President; James T. O'Connor, Treasurer; R. A. Walberg, Secretary; William Linklater, Director; Edward Kennedy, Director; Cecil Wright, Production Manager; C. J. Evely, Installation Manager; J. J. Kasper, Electrical Engineer; R. Korff, Mechanical Engineer; William Clow, Special Engineer; M. Peterson, Draftsman; Walter Marbach, Draftsman; Walter Nyren, Production Man; B. O'Connor, Asst. Sales Manager; Paul Lang, Accountant; D. Skidmore, Laboratory Technician; R. Dalton, Secretary; J. Condron, Laboratory Technician; W. Bielefieldt, Laboratory Technician; P. Mecozzi, Laboratory Technician; Blaine H. Vlier, Sales; R. E. O'Brien, Secretary; Christopher Sciortino, Maintenance Man.
High voltage equipment used for automatic electronic spray painting.

Automotive Rubber Co., Inc. **C-9, 10**
8601 Epworth Boulevard, Detroit 4, Michigan.
R. L. Redmond, Vice President; William C. Enright, Non-Production Sales Manager; Cliff Olsen, Sales Engineer; R. H. Glezen, Advertising; G. C. Ludwig, Chief Engineer.
Rubber Lined Plating Tanks and Components. Rubber Lined Diaphragm Plating Systems and Components. Pipe and Fittings.

Bart-Messing Corp. **S-30-31**
229 Main Street, Belleville, New Jersey.
S. G. Bart, Secretary; M. M. Messing, President; E. R. Redlhammer, Vice President; R. L. Ruleff, Western Sales Manager.
Water Cooled "reactronically" controlled Sel-Rex Selenium Rectifiers. Standard line of Sel-Rex Selenium Rectifiers.

Beacon Supply Co. **E-2**
110 Marginal Street, Chelsea, Massachusetts.
Max L. Feinberg, President; Albert N. Farnham, Vice President; Louis A. Tanner, Sales Manager; Robert S. Deacon, Vice President; John P. Nix, Chicago Representative; John A. Turk, Cleveland Representative.
Beaco Bias Buffs. Ray Compounds. Complete Line of Buffing Compounds.

Belke Mfg. Co. **R-15, 16, 17, 18**
947 N. Cicero Ave., Chicago 51, Illinois.
Plating Racks. Salt Spray equipment.

G. S. Blakeslee & Co. **S-17, 18**
1844 South 52nd Avenue, Chicago 50, Illinois.
M. B. Pickett, Treasurer; H. N. Arnold, Sales Manager; R. A. Kully, Industrial Sales Division; J. Pokorny, Chemist & Service Manager; A. L. Rashe, Field Engineer; G. W. Anderson, Field Engineer; A. S. Reichel, Field Manager; N. Happ, Field Engineer; W. F. Goodwin, Field Engineer; J. Bunch, Field Engineer.
Special large Liquid-Vapor Degreasing Machine.

Wesley S. Block & Co. **E-32-33**
39-15 Main Street, Flushing, New York.
Wesley S. Block, President; Harry Walker, Dr., General Manager; C. F. Norcross, Field Representative; Cecil E. Bringham, Director; Kergan Wells, Manager (Richardson-Allen of Canada); William Van Dongen, Field Representative; Victor Allen, Field Representative.
Heat exchanger of rectifier which permits operation of selenium stacks at high ambient temperatures and under abnormally heavy loads and in corrosive atmospheres. Equipment for extremely accurate control of voltages and currents.

W. H. Brady Co. **E-34**
204 W. Washington, Milwaukee, Wisconsin.
W. H. Brady, President; G. P. Burns, Manager—Adv. & Sales Promotion.
Brady Quik Masks. Brady Safety Signs. Brady Pipe Markers. Stencils. Gaskets.

Branch Exhibits
American Electroplaters' Society
A-9-10-11-12-13-14-15-16-17-18-19-20-21-22

The Buckeye Products Co. **R-7**
7020-34 Vine Street, Cincinnati, Ohio.
Charles Wise, Secretary; Arthur Hoffmeier, Jr., Vice President; Lowell S. Fisher, Lowell S. Fisher Co., Indianapolis; E. G. Goss, Detroit, Michigan.
Speedie Buffing and Polishing Compositions, bar and liquid forms.

Buckingham Products Co. **G-1-2**
14100 Fullerton Avenue, Detroit, Mich.
R. M. Buckingham, President; H. J. Patterson, J. R. Valrance, J. B. Lyon, R. O. Blackford, L. M. Ring, H. E. Gray, William S. Gray.
Polishing and Buffing Compositions.

The Chemical Corp. **R-14**
54 Waltham Avenue, Springfield, Mass.
K. P. Bellinger, Vice President; B. H.

Gardner, Vice President; J. C. Kosmos, Technical Sales & Lab Consultant; Joseph Manz, Chicago Area Representative.
Pla-Tank Resin-Bonded Fiberglas. Tanks, Vent Hoods, Ducts, Pipe, Crocks, Plating Barrels, (in all sizes). Luster-On — the bright dip for zinc plate. Khaki Drab passivating dips.

Chicago Electro-Platers Institute **A-1-2-3-4-5-6, G-9-10-11**
Two complete plating lines in operation — one decorative . . . one protective. Various articles showing a variety of plating finishes.

Chicago Thrift-Etching Corp. **S-21, 22**
1555 North Sheffield Avenue, Chicago 22, Illinois.
L. F. Lamm, Vice President; W. A. Schomburg, Vice President; G. D. Camp, Alumilite Sales; L. C. Rodman, Manager Bank Sales; G. M. Boes, Sales; R. C. Anderson, Sales; J. W. Sanders, Sales; J. D. McMahon, Sales; R. A. Bradle, Sales; C. J. Russell, Supt.; J. E. McCarty, Production Manager; R. M. Wolter, Asst. Supt.; R. R. Jaeger, Laboratory; A. S. Clausen, Sales; J. B. Alexander, Sales; W. E. Langrill, Sales; R. E. Pettit, Vice President.
Finishes — Brite Dip — Scales Panels.

Commercial Filters Corp. **D-10**
18 West Third Street, Boston 27, Mass.
R. L. Fielding, Vice President; J. R. Chisholm, Sales Manager (engineer); F. P. Beardslee, Manager Chicago Area; P. R. Matravers, Sales Engineer, Chicago Office.
Portable stainless steel Fulflo Filter. Honeycomb Filter Tubes. Fulflo Filters.

Conforming Matrix Corp. **S-11-12**
Toledo Factories Building, Toledo, Ohio.
A. J. Spelker, President; H. E. MacArthur, Vice President; Mrs. E. M. MacArthur, Secretary; Milton T. Schimmel, Sales Engineer; Elmer L. Faber, Supt. of Production; Richard Salhoff, Salesman.
Mask Washing Machine. Spray painting masks. Spray painting machines.

Creative Development & Mfg. Co. .. **C-23**
2222 East First Street, Dayton 3, Ohio.
Bruce Slonneger, Pres.; Everett Schafer, Sec'y-Treas..
Air-flow Exhaust Hoods.

Crown Rheostat & Supply Co. .. **R-2-3-4-5**
3465 North Kimball Avenue, Chicago 18, Illinois.
G. E. Huenerfauth, President; J. G. Alberson, Exec. Vice President; Fred Green, Vice President; C. E. Clindinin, Sales Engineer; Jean Runtz, Sales Manager; William Meggers, Sales Engr.; John Pauga, Sales Engr.; Walter Swenson, Sales Engr.; Robert Walworth, Sales Engr.; Don Kraft, Sales Engr.; Robert O'Neil, Sales Engr.; Daniel Abenanti, Sales Engineer; M. J. Hepburn.
Plating Rheostats. Rectifiers. Plating Barrels. Centrifugal Dryers. Tumble Finishing Equipment.

DeMott Industries **A-8**
216 N. Jefferson St., Chicago, Ill.
Theron DeMott, Pres.
Testing Equipment.

Detrex Corp. **S-1**
Box 501, Detroit 32, Michigan.
W. F. Newbery, Director of Sales; L. Camel, Sales Manager, Industrial Division; W. H. Webb, Alkali Product Manager; E. H. Ehlert, Region Manager; G. W. Walter, Advertising Manager; W. F. Lucas, Regional Product Supervisor.
Vincote wall coating compound for spray booths. Detrex Phosphate Coating compounds for rust-proofing. Detrex alkali and emulsion cleaning compounds. Degreasing solvents. Degreasing machines and industrial washers.

Detroit Chemical Specialties **E-23-24**
101 South Waterman, Detroit, Michigan.
C. H. McAleer, President; Edward Van Zandt, Sales Representative; James J. Ryan, Sales Representative; Robert E. Whalen, Technical Director.
Polishing and Buffing Compounds containing "Lustre Seal." Polishing and Buffing Compounds. Buffs and Wheels. Rubbing Compounds. Abrasive Belts and Discs.

This modern building houses the Electro-Platers Company in Milwaukee, Wisc.

Diamond Alkali Co. **Q-28**
300 Union Commerce Bldg., Cleveland, Ohio.
Charles E. Grant, Manager Chromium Chemicals Sales; E. L. Combs, Technical Service Representative; C. L. Troph, Sales Representative; K. S. Lewis, Sales Representative.
Chromic Acid. Caustic Soda. Bichromate of Soda.

Distillation Products Industries ... **E-14**
755 Ridge Road, West Rochester, N. Y.
Tom C. Comer, Chicago Field Manager; Joe E. Swope, Chicago Technical Representative; Alvin H. Hartman, Sales Manager; Everett M. Brown, New York Field Manager; Gerald C. Waterman, Rochester Technical Representative.
Many examples of high vacuum metallized metal products produced with vacuum coating equipment.

The Diversey Corp. **Q-22-23-24**
1820 Roscoe Street, Chicago 13, Illinois.
R. L. Shannon, Manager of Metal Industries Dept.; R. J. Stell, Assistant to the General Sales Manager; B. B. Button, Assistant to the General Sales Manager; P. A. Jackson, Assistant to Mr. Shannon.
Diversey Divobond. Diversey #101. Aluminux.

Dow Chemical Co. **E-13**
1000 Main Street, Midland, Michigan.
Saran lined pipe, fittings, valves, pumps, special molded parts in Saran and Saran-rubber, special Saran protective coatings.

Du-Lite Chemical Corp. **E-25**
Middletown, Conn.

E. I. Du Pont de Nemours & Co. **C-3-4**
Wilmington 98, Delaware.

Electric Products Co. **P-9-10**
1725 Clarkstone Rd., Cleveland 12, Ohio.

Electrofilm Corp. **E-21**
7116 Laurel Canyon Blvd., North Hollywood, California.
Dale Rice, Allen Aircraft Prod. Co.; Dick Gordon, Pyrene Mfg. Co.; Tom Graff, Metro Electro Processing Corp.; F. E. Pollock, Electrofilm Corp.; J. W. De Dapper, Electrofilm Corp.
Electrofilm "Lube-Lok" Lubrication. Electrofilm "Electro-Flex" heating tape. "Lube-Lok" provides locked in lubrication for all moving parts.

Electronic Rectifiers, Inc. ..... **Special Island "A"**
2102 Spann Avenue, Indianapolis 3, Indiana.
Charles R. Ogle, President; Paul B. Freeman, Chief Engineer; Amory V. Beeler, Shop Supt.; Gordon E. Gray, Chicago Representative; Walter Craigle, Adv. Representative.
Water Cooled Magnesium Copper Sulphide Rectifiers. Dry Contact Magnesium Copper Sulphide Rectifiers and Power Supplies.

Enthone, Inc. **P-7-8**
442 Elm Street, New Haven, Conn.
Dr. W. R. Meyer, President; J. F. Buckman, Vice President; C. C. Helmle, Secretary; Plus, Engineers and Sales-Service Personnel.
Alkaline Derusting Process with separate demonstration of simultaneous derusting and plating in the same tank.

Dyed Coatings on aluminum. Plated coatings on aluminum. Black coatings on copper, brass, zinc and steel.

Finishing Publications, Inc. **Q-18**
381 Broadway, Westwood, New Jersey.
Palmer H. Langdon, Assistant Publisher; Thomas A. Trumbour, General Manager; Joan T. Wiarda, Sales Manager; Walter A. Raymond, Editor.
Copies of METAL FINISHING, ORGANIC FINISHING and annual GUIDEBOOK DIRECTORIES latest editions.

Formax Mfg. Corp. **D-23-24**
3171 Bellevue Avenue, Detroit 7, Mich.
Howard J. McAleer, President; Edward W. McAleer, Vice President; Edward D. McAleer, Sales Manager; Joseph J. McAleer, Vice President; Richard I. McAleer, Sales Representative; Stuart Rodger, Sales Representative.
New inter-locking, ventilated bias type buffing wheel. Buffing Wheels, Polishing Wheels and Buffing Compound.

Gasway Corp. **G-3**
6463 N. Ravenswood Ave., Chicago 26, Illinois.

General Chemical Division
Allied Chemical & Dye Corp.....**E-3**
Edgewater, N. J.

The Globe Chemical Co., Inc. **E-17**
Murray Road & Big 4 R R, Cincinnati 17, Ohio.
Malcolm T. Fogg, Asst. Secretary & Technical Director; Karl F. Jung; Theodore J. Andrews, Battelle Development Corp.; J. E. Bride, Battelle Development Corp.; Dr. Charles L. Faust, Battelle Development Corp.; William H. Safranek, Battelle Development Corp.
Electroplating of metals. Chemical Polishing of Metals. Immersion Tin Plating. Immersion Lead Plating.

The Grav-I-Flo Corp. **F-7**
400 Norwood Avenue, Sturgis, Michigan.
R. L. Davidson, President; L. R. Davidson, Vice President; Earle R. Bogema, Chief Engineer.
Grav-I-Flo new two deck parts-and-chips separator and chip grader. Grav-I-Flo Tumbling process.

W. Green Electric Co., Inc. **R-1**
130 Cedar St., New York 6, N. Y.
Rectifiers and Control Equipment.

Hammond Machinery Builders, Inc. ..... **B-23-24 & C-11-12**
1600 Douglas Avenue, Kalamazoo, Mich.
S. H. Miller, Sales Manager; R. N. Shaw, Sales Manager; R. M. Bell, Technical Manager; L. N. Albrecht, District Representative.
Hammond Model C-46-40; continuous rotary with four 15 HP. Hammond Model C-4120; abrasive belt unit for converting buffing heads to polishing heads. Hammond Model 51-94; polishing and buffing head stand unit. Hammond Variable speed polishing and buffing lathe for buffing. Hammond Cyclone Type Duskolector. Hammond Contour Abrasive belt finisher. Four different styles of automatic polishing, buffing and Deburring heads.

Hanson-Van Winkle Munning
P-18-19-20-21 & Q-11-12-13-14
Church Street, Matawan, New Jersey.

Chrome-Rite Company, 4534 West North Avenue, Chicago.

Van Winkle Todd, Chairman of the Board; Louis M. Hague, President; John A. Bauer, Vice President; H. R. Smallman, Asst. Vice President; R. M. Norton, Sales Manager; M. B. Diggin, Technical Director; B. C. Case, P. R. Lyons, C. M. Knights, J. D. Kershaw, H. L. Wright, H. W. Marx, G. R. Lyons, M. J. Moll, E. H. Hanlon, W. R. Lockwood, C. A. Pickering, C. E. A. Solla, W. M. Teets, G. G. Knecht, R. R. Oranquist, D. C. Murphy, E. C. Bosl, G. E. Verstegen, A. D. Squitero.

New Mercil Type Centrifugal Dryer. Horizontal Type Plexiglas Cylinder. Portable Plating Barrel Apparatus. Selenium Type Rectifier. Chrom-Flo Lead Anodes. P. R. Controller. Model Elevator Type Conveyor. Tank Rheostat. Generator Brush Panel. Various Supply Items. Laboratory Display Boards.

The Hansen Chemical Co. **E-10-11**
1945 East 97th Street, Cleveland 6, Ohio.
To emphasize all Harshaw electroplating processes: Acid Tin, Bright Barrel Nickel, Bright Nickel, Cadmium Fluoborate, Copper Fluoborate, Lead Fluoborate, Perflow Nickel, Tin Fluoborate, Zinc Fluoborate.

H. N. Hartwell & Son, Inc. **F-9**
Park Square Building, Boston, Mass.
Laurence N. Thomas, Division Sales Manager; Michael Shaw, Sales Engineer; Kenneth P. Chamberlain, Vice President of Sales, Plastic Div.
Boltaron non-plasticized rigid polyvinyl chloride. Sheets—29x56". Bar—½" to 1" Diameter. Pipe—⅜" to 4" Diameter. Material—1/6" to 1" thick.

Haveg Corp. **S-24**
Newark, Delaware.

Jacob Hay Co. **E-12**
4014 West Parker Avenue, Chicago, Ill.
Harry F. Gardino, Vice President; Earl De Loof, Vice President; Fred LeFebvre, Salesman; Andrew Hay, Salesman; B. J. Shields, Salesman.
Special Pouring Spout. Cleanrite Cleaners. Williamsville Buffs. Torit Dust Collectors. Standard Electrical Tool Company — Buffing Lathe. Clearview Filter. Flo-Red Immersion Heaters.

Heatbath Corp. **C-25**
Springfield 1, Mass.

Heil Process Equipment Corp. **S-15-16**
12901 Elmwood Avenue, Cleveland 11, Ohio.
C. E. Heil, President; H. P. Heil, General Manager; E. W. Vereeke, Sales Manager; R. I. Peters, District Sales Engineer; K. W. Grader, District Sales Engineer; E. G. Huth, Asst. General Manager.
#1251 Exchanger. Lead Anodes. Nocordal. Lined Tanks. Acid-Proof Systems. Lined Pipe. Fume Scrubbers.

R. O. Hull & Co., Inc. **P-5-6**
1300 Parsons Court, Cleveland, Ohio.
R. O. Hull, President; J. B. Winters, Technical Director; E. B. Wild, Technical Representative; R. O. Wild, Technical Representative; C. H. Miller, Technical Representative; R. C. Platt, Technical Representative.
Rohco Imperial Silver Brightener. Comet Rectifier. Rohco Current Tester. Forcite Anode Baskets. "NO-Cro-Mist" for chrome baths. Hull Cell Plating Test Sets. Miscellaneous chemical products.

Illinois Water Treatment Co. **E-26**
840 Cedar Street, Rockford, Illinois.
John F. Wantz, Secretary-Treasurer; W. S. Morrison, Vice President; F. H. Kahler, Sales Manager.
Illco-Way Ion-exchange equipment including the new Ill-co-Way Chrome Solution. Illco-Way packaged Deionizers which provide solids free water for plating rinse.

Imperial Plating Rack Co. **S-13-14**
National Rack Company
American Rack Company
E. L. Faulman, President of all three companies; J. F. Herr, Vice President, National Rack Company; L. D. Faulman, Vice President, Imperial Plating Rack Co.; William Zube, Vice President, Rack Company; Robert Preston, Sales Engineer, National Rack Company; A. Smith, Sales Engineer, Imperial Plating Rack Company; J. Kurdenok, Sales Engineer, American Rack Company.
Plating rack and fixtures for all new defense requirements. Announcing the

opening of the new Imperial Plating Rack, Plant #2. Naraco plating racks for job plating and automatic machinery.

Industrial Electroplating Co., Inc. **D-32-33**
210 W. Vermont St., Indianapolis 4, Indiana.

Industrial Filter & Pump Mfg. Co. **R-11-12-13**
5900 Ogden Avenue, Chicago 50, Illinois.
R. E. Liedberg, H. Jensen, H. W. Faint, W. B. Johnson, K. C. Blin, J. F. Brossart, J. R. Miller, M. Van Loan, S. Clements.
Modifications and Improvements on Filters, Heat Exchangers. Demineralizers and Salt Fog Corrosion Test Cabinets.

International Nickel Co. **P-23-24**
67 Wall Street, New York 5, New York.
R. J. McKay, Supervisor Electroplating Section; C. H. Sample, Engineer; W. H. Prine, Engineer; L. W. Barber, Platinum Metals Promotion; W. R. Ferguson, Director of Shows and Exhibits.
Some representative examples of industrial uses for nickel plating.

Kocour Co. **Q-26**
4800 South St. Louis Avenue, Chicago, Illinois.
C. Kocour, Partner; Orville Kocour, Partner; Leslie J. Kocour, Partner; Everett Hodges, Chief Chemist.
Kocour Electronics Thickness Tester. Kocour Electronic Thickness Tester Accessory Unit. Various models of our line of Kocour Test Sets for controlling plating, cleaning, pickling, anodizing and heat treating baths, deposit thickness testing, and other control instruments.

Kraft Chemical Co. **S-5-6**
Kaynide Division.
917 West 18th Street, Chicago, Illinois.
Gerald G. Kraft, Manager; Ben Johnson, Assistant Manager; Carmen Caruana, Sales Promotion; Harry Stopek, Technical Salesman; Dr. Stanely Dulsky, Sales Advisor; James Frisco, Chief Disatcher; Bill Brandes, Traffic Control.
Kupromerse—Copper plating by immersion giving copper deposit that is bright, of even color and adherent. Copper Ball Anodes. Zinc Ball Anodes. White Brass Anodes.

LaSalco, Incorporated **E-9-10**
2818-38 La Salle Street, St. Louis, Missouri.
H. J. Struckhoff, President; C. R. Hamm, Assistant Sales Manager; N. K. House, Chief Engineer; C. H. Pinkerton, Secretary; A. G. Rignall, R. E. Delgman, K. S. Repp, B. G. Daw, F. A. Menniges, A. P. Wrisberg.
Lasalco Spiral Type continuous metal parts dryer.

The Lea Manufacturing Co. **R-20-21**
16 Cherry Avenue, Waterbury, Conn.
Robert S. Leather, President; Earl W. Couch, Vice President & Treasurer; Richard P. Crane, Vice President of Sales & Adv.; Ellsworth T. Candee, Director of Research; Francis L. Bergin, Asst. Director of Research; Dr. H. L. Kellner, Technical Director; Dee F. Mosher, Western Division Manager; Leo J. Bakinow, Sales Promotion; S. Lewis Doughty, Technical Service.
Lea Copper Glo — Lea Liquibrade — Leabrasive — Leabrament — Emulsabrade — Leamatic Compound — Lea Greaseless Red Rouge — Learok Extruded and Poured — Lea Red Rouge — Lea Lapping Paste — Lea Liqualube — Grain Lubar — Lea Grease Stick — Leatardent — Lea Silver Glo — Lea Kromsavers — and Kromkubes — Lea Lectromag — Lea Spray Gun Mover. Lea Compound — Artab — Learok — Adleasive — Lea Nickel Glo — Lea Mirro-Glo — Lea Clad Cadmium Process — Lea Synstrip — Lea Analytical Method of Plating Solution Control.

Lewis Electrical Mfg. Co. **Q-21**
1943 Walton Avenue, New York 53, New York.
Victor Lubin, General Manager; Herbert Lewis, President.
Lewis Rectifiers. Vari-Plater. Periodic-Reverse Controls.

Chas. F. L'Hommedieu & Sons Co. **C-18-19-20-21**
4521 Ogden Ave., Chicago 23, Illinois.

A. J. Lynch & Co. **E-22**
2424 Enterprise St., Los Angeles 21, Calif.
T. A. Turner, Sec'y.; J. C. Washington, Sales Mgr.
Met rectifiers.

MacDermid Incorporated **R-27-28**
Harold Leever, Vice President; William Innes, Technical Director; Edward F. Stack, Thomas F. O'Brien.
MacDermid Bright Copper. MacDermid Chemical Bright Dips. Phosphate Materials. Cleaning & Burnishing Compounds, Laminex Fiberglas Tanks.

The Matchless Metal Polish Co. ... **Q-19-20**
840 West 49th Place, Chicago 9, Illinois.
E. G. Coffey, Vice President; I. E. Olson, Salesman; G. Lambert, Salesman; J. Raven, Salesman; P. E. Unruh, Plant Manager; D. Whittenburg, Salesman.
Display of customers products processed with Matchless materials.

The McGean Chemical Co. **B-11-12**
25 Prospect Ave., N.W., Clevleand 15, Ohio.

Metal Finishing **Q-18**
381 Broadway, Westwood, New Jersey.
Palmer H. Langdon, Assistant Publisher; Thomas A. Trumbour, General Manager; Joan T. Wiarda, Sales Manager; Walter A. Raymond, Editor.
Copies of METAL FINISHING, ORGANIC FINISHING and annual GUIDEBOOK DIRECTORIES latest editions.

Metal & Thermit Corp. **D-15-16**
100 East 42nd Street, New York 17, New York.

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Wyandotte Pre-Fos — Outstanding cleaning-phosphating compound. Wyandotte line of metal cleaning and related products.

ABSTRACTS

(*Concluded from page* 92)

The Benefits to the Plater of the A.E.S. Research Program

By *Earl J. Serfass*

The summary of the progress and accomplishments of the A.E.S. Research Committee during the past year is presented. Practical developments of use to the average plater are stressed.

Practical Aspects of the Atomizer Test

By *Henry B. Linford*

The atomizer test, a new degreasing evaluation method developed in A.E.S. Research Project No. 12, is discussed from the standpoint of plating shop usefulneses. Practical applications of the atomizer test which are discussed include: First, the test may be used to check the affectiveness of an operating cleaner on a control basis; second, the test is useful as a check in new cleaner formulations in comparison with those being used in the shop; third, the atomizer test provides a means of evaluating the removal of new oils, the use of which may be contemplated prior to the finishing operation.

Engineering and Economic Aspects of the Treatment of Cyanide Waste

By *Barnett F. Dodge*

The various processes studied by A.E.S. Project No. 10, are reviewed and practical data on cost, equipment, and operating hints are presented with regard to the treatment of cyanide wastes.

Chromium Plating Baths Containing Fluorides or Fluosilicates

By T. A. Hood, F.M.T.C., *Defense Research Laboratories, Maribyrnong, Victoria, Australia*

CHROMIUM plating baths that can rapidly deposit relatively thick coatings under commercial conditions are of particular interest at present. The current nickel shortage has created a demand for alternative finishes, and those thicker chromium coatings give satisfactory protection without an undercoat of nickel in some applications. The conventional chromic acid/sulphate bath is firmly established as the most popular in commercial chromium plating, but it suffers from shortcomings such as low cathode current efficiency, poor throwing power, narrow plating range, and need for close control of bath balance.

Fluorides and fluosilicates have been known for many years to be effective catalysts in chromium plating solutions, and solutions containing them have important advantages over the conventional baths containing sulphuric acid. The literature on fluorides and fluosilicates as catalysts, much of which is found only in German publications, is reviewed in this paper, and the operating characteristics of solutions containing them are compared with those of the conventional solution.

As early as 1905 fluorides, chlorides, nitrates, phosphates, and borates were suggested for use as catalysts, and *Müller*[1] (1926) found that chlorides, nitrates, chlorates and fluosilicates were effective. *Haring* and *Barrows*[2] (1927) published a comprehensive review of the subject, and they recognized that any anion which would not be decomposed or precipitated by chromium in any of its valences could serve as a catalyst, and stated that the form in which this anion was added, whether in combination with hydrogen (as an acid) or with metals ordinarily considered as more negative or more positive than chromium, seemed theoretically of no consequence, provided only that the metal added was not itself deposited. They found that acetic acid was effective, and in further experiments established fluorides as one of the most promising catalysts. In U. S. A., *Fink's* patent[3] (1926) mentioned the use of fluoride, sulphate, phosphate and borate radicals as catalysts, and in further patents he specified fluosilicic acid (1932) and fluoboric acid (1933). *Sohn* and *Raddock*[4] (1931) patented the use of fluosilicic acid plus sulphuric acid.

In Germany, bright chromium plating baths containing fluosilicic acid were introduced about 1930, but were not much used; hard chromium baths containing fluosilicic acid plus sulphuric acid, however, became popular later.[5] *Gardam*,[6] who investigated the German plating industry in 1945, reported that the addition of sulphates to chromic acid baths had been covered by a master patent at some previous time. Fluoride additions had, therefore, been widely used in Germany in place of sulphates to avoid payment of royalties and not because of any special technical advantage. The bath containing fluosilicates used by *Heinrich Reining & Co.*, Dusseldorf, and described later in this paper, was used for the hard chromium plating of a large number of ordnance parts, but was eventually replaced by a conventional chromic acid/sulphate bath. In barrel plating, the superior throwing power of solutions containing fluosilicic acid is of particular value, and these solutions were used for this purpose by *Langbein-Pfanhauser Werke A.G.*[7] about 1929, and later by others.

The use of baths containing fluosilicic acid for both hard and decorative chromium plating in U. S. A. was reported by the *Ford Co.* in 1936. The latest U. S. development in chromium plating baths, uses "mixed and co-operating catalyst acid radicles" including sulphate.[8] *Bregman*[9] states that fluosilicates are used in this bath. The concentration of the catalysts is automatically controlled by the solubility characteristics of the special addition agents (composition not stated) included in the mixture. The bath is maintained by adding sufficient mixture to keep it at the specified density, and no chemical analysis is required. Two such baths are in common use; one operates at 21° Bé and the other at 31° Bé. Claims for the process include improved current efficiency (30-50% better than the conventional bath) and good throwing power.

In decorative plating, these new solutions are claimed to be better than the conventional bath for plating chromium over passive nickel. The passivity of some bright nickels causes mottled and streaked deposits when they are plated in conventional chromium baths, but this trouble is said to be eliminated by the activating effect of the new baths. Current interruptions are less likely to cause dulling or streaking of decorative deposits when the bath[8] is used.

Characteristics of Chromium Plating Solutions

A description of the operating characteristics of chromium plating solutions containing various catalysts follow:

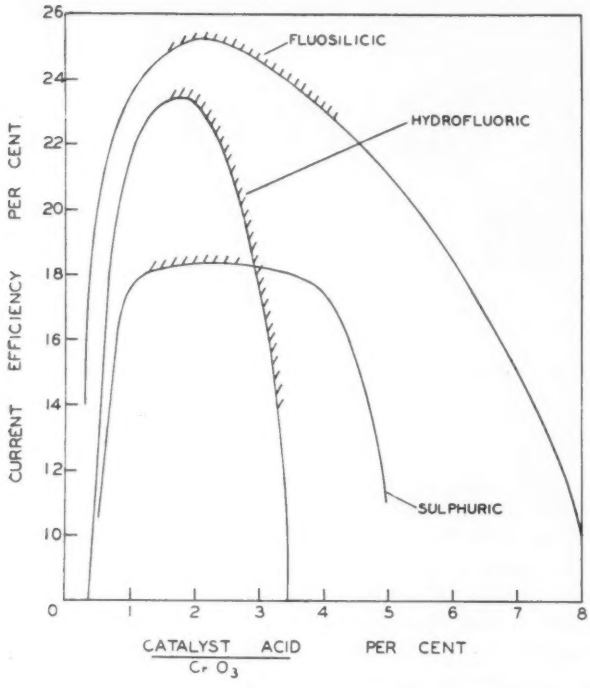

FIG 1 RELATION OF CURRENT EFFICIENCY TO CATALYST ACID CONTENT (BILFINGER [5])

Current Efficiency vs. Catalyst Acid Content

In general, increasing the concentration of catalyst acid in the bath usually causes the current efficiency curve to rise steeply at first, reach a maximum and then fall. The curves in Fig. 1 (taken from *Bilfinger*[5]) show the relation between current efficiency and concentration of catalyst acids expressed as percentage of chromic acid content; namely sulphuric acid, hydrofluoric acid and fluosilicic acid. The bath used contained CrO_3 250 g./l., bath temperature was 55°C. and current density 50 amp./sq. dm. (460 amp./sq. ft.). The shaded portions of the curves show the concentrations of catalyst acids at which bright hard chromium deposits with least brittleness are obtained, and the corresponding current efficiencies. Highest current efficiency for each catalyst acid occurred between 1 and 2.5 per cent of the chromic acid content. Baths containing hydrofluoric or fluosilicic acid have higher current efficiencies, under the same conditions, than baths containing sulphuric acid, the maxima (see Fig. 1) being 23.5, 24.5, and 18.3 per cent respectively. No improvement in efficiency is obtained by adding hydrofluoric or sulphuric acid as well as fluosilicic acid. Addition of these acids reduces efficiency, but sulphuric acid is added in order to retard dissociation of the fluosilicic acid. (No explanation of this last phenomenon has been given).

Current Efficiency vs. Chromic Acid Concentration (in the presence of fluosilicic, hydrofluoric or sulphuric acid)

At a given temperature and current density, current efficiency depends on the concentration of chromic acid and on the nature and concentration of the catalyst acid. The variation of current efficiency with concentration of chromic acid ranging from 50 to 400 g./l. is shown in Fig. 2 for three different catalyst acids in the following constant concentrations expressed as a percentage of chromic acid content (approx. the optimum concentrations shown in Fig. 1) as follows: sulphuric acid, 1.2 per cent; fluosilicic acid, 2 per cent, and hydrofluoric acid 1.4 per cent. Bath temperature is 55°C., and current density 50 amp./sq. dm. In baths using sulphuric acid as catalyst, current efficiency decreases with increasing concentration of chromic acid, but in baths containing hydrofluoric or fluosilicic acid current efficiency rises to a maximum and then falls.[5]

Current Efficiency vs. Temperature and Current Density

Current efficiency increases as cathodic current density increases and as bath temperature falls (see Table 1). The figures underlined in Table 1 indicate serviceable, hard, bright chromium deposits; other figures represent exfoliating, grey, dull or brittle deposits.[5] In practice, economic factors as well as theoretical considerations have influenced the choice of a temperature of 50-55°C. and a current density of 40-50 amp./sq. dm. as the usual working range for baths of the type given in (c) in Table 1.

Table 1

Relation of Current Efficiency to Temperature and Current Density

(a) 250 g CrO_3/l and 1.0 per cent H_2SO_4 (based on CrO_3 content).

Current density amp./sq. dm.	Temperature °C. 25	35	45	55	65
	per cent	per cent	per cent	per cent	per cent
10	23.7	12.8	11.9	10.2	----
20	32.2	*19.2*	15.6	12.5	----
30	35.7	*24.9*	*17.8*	*16.2*	11.5
40	----	*29.4*	*18.9*	*17.0*	13.1
50	----	33.6	*19.9*	*17.9*	*14.6*
60	----	35.7	20.8	*18.8*	*15.5*
70	----	----	21.5	19.4	*16.4*

(b) 400 g CrO_3/l and 1.0 per cent H_2SO_4 (based on CrO_3 content).

10	17.2	9.3	8.1	----	----
20	25.6	*16.9*	12.0	11.8	----
30	29.1	*24.2*	*15.5*	12.1	6.8
40	----	27.9	*17.2*	*13.7*	8.9
50	----	31.6	*18.6*	*14.6*	10.7
60	----	34.5	19.8	*15.2*	*12.2*
70	----	----	20.7	15.7	*13.1*

(c) 250 g CrO_3/l and 0.6 per cent H_2SO_4, 1.6 per cent H_2SiF_6 (based on CrO_3 content).

10	14.8	*13.1*	*9.0*	8.6	----
20	24.5	*20.1*	*18.3*	*15.8*	12.4
30	30.2	21.8	*23.0*	*20.5*	*17.6*
40	----	24.2	*25.1*	*22.5*	*21.1*
50	----	26.3	25.8	*24.8*	*23.0*
60	----	28.5	26.3	*26.1*	*24.7*
70	----	----	26.7	26.5	*26.4*
100	----	----	----	27.5	26.5

Bilfinger[5]

Brenner[10] in his work on the physical properties of chromium deposits confirmed that fluoride baths have a higher efficiency than sulphate baths operated under the same conditions. The S.R.H.S. bath is claimed to give substantially higher cathode current efficiencies than the conventional sulphate bath under comparable conditions. Current efficiency of S.R.H.S. baths is also higher at lower temperatures, as it is with the baths studied by Bilfinger.

Effect of Addition Agents

Salts of metals such as trivalent chromium, iron, copper, nickel, alkali and alkaline earths are sometimes added to hard chromium baths in order to improve conductivity and current efficiency.[5] The addition of a small amount of maleic or tartaric acid to a bath containing hydrofluoric acid is claimed by *Raab*[11] to improve the chromium deposit. Soluble molybdenum compounds, such as ammonium molybdate, are claimed by *Berger*[12] to result in highly lustrous chromium deposits when added to baths containing fluosilicic acid.

Bath Operation at Heinrich Reining & Co., Dusseldorf

The composition of the bath used by *Heinrich Reining & Co.*, Dusseldorf, Germany, together with a detailed description of the control routine, is given in *British Intelligence Objectives Sub-Committee Report No. 429.*[6] A rather dilute solution was used containing 160 to 180 g./l. chromic acid and 2.7 per cent fluosilicic acid (doubly purified, sp. gr. 1.175). In making up the bath, 60 ml. of this fluosilicic acid was added for each kilogram of chromic acid, and the freshly prepared bath had a density of 15 to 16 °Bé (sp. gr. 1.075 to 1.080). It seems that, in order to simplify control of the bath, a bath life, expressed in amp. hr./l, was arbitrarily decided upon. A record of the ampere-hours used by each bath was kept, and analyses made at specified percentages of bath life. As routine control measures, the following determinations were made after each 1% use.

1. Density (°Bé)
2. (a) Free chromic acid
   (b) Free and combined (chromate) chromic acid
3. Trivalent chromium
4. Iron
5. Conductivity

Current efficiency and foreign acid content were estimated at each 2% of bath life.

The following precautions must be taken to ensure satisfactory operation of the bath:

(a) The free chromic acid content should not be allowed to fall below 100 to 110 g./l.

(b) The content of trivalent chromium (expressed as metal) should not exceed 14 to 17 g./l. and when necessary, may be reduced to 6 to 9 g./l. by plating any workpiece using hard lead anodes and a surface ratio, cathode/anode of at least 1:3. Trivalent chromium is oxidized, and the free chromic acid content raised thereby.

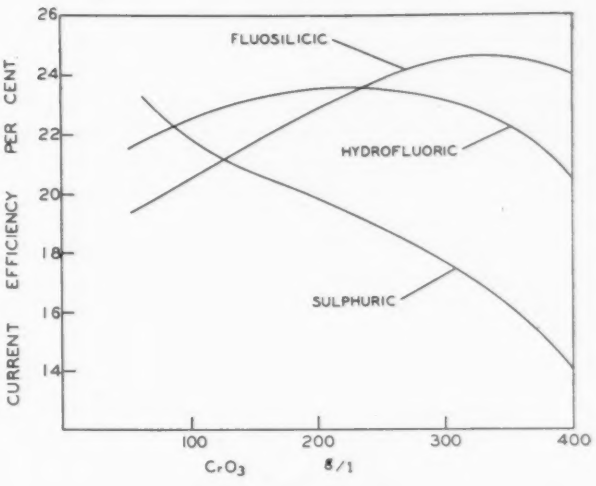

FIG. 2. RELATION OF CURRENT EFFICIENCY TO CHROMIC ACID CONCENTRATION IN THE PRESENCE OF DIFFERENT CATALYST ACIDS (BILFINGER[5])

(c) Iron content of the bath should not exceed 8 to 10 g./l.

(d) Fluosilicic acid content should be maintained in correct proportion to the concentration of *free* chromic acid namely, 55 to 60 ml. H_2SiF_6 per kg. of CrO_3.

(e) Current efficiency should not fall below 15%, and should be determined when there is any doubt about the condition of the bath after making the usual analyses.

(f) The copper content should not exceed 2 g./l.

Anodes

The conventional pure lead or lead-antimony alloy anodes have been used with baths containing fluorides, but the corrosiveness of these solutions has caused some difficulty. *Müller*[13] recommended lead alloys containing between 20 and 30% of antimony to reduce the considerable increase in transfer resistance that occurs with pure lead anodes when current is interrupted and then recommenced. Even with the lead-antimony alloy a hard coating of lead fluoride or lead silicofluoride is formed, and the periodic cleaning that is necessary increases the rate of wear. *Gebauer*[14] found that the use of antimonial-lead anodes had no detrimental effect on the chromium plate, although antimony was easily detectable in the bath, and the deposit also contained small amounts of antimony.

Arend[15] states that lead alloys containing 2% silver and 2% zinc have been used successfully in baths containing fluorides. For use with the S.R.H.S. solution, *Stareck*[8] recommends the 93 per cent lead—7 per cent tin alloy anodes, because they are easier to keep clean than antimonial-lead anodes.

Barrel Chromium Plating

Since the first commercial development of chromium plating, development of the barrel method has attracted numerous investigators. Encouraging results were often obtained using the conventional chromic acid/sulphate bath, and most workers believed that improvements in barrel design alone would bring success. The use of solutions containing fluorides and fluo-silicates that have a higher current efficiency and better throwing

power than chromic acid/sulphate baths, however, was a major factor in the development of satisfactory barrel chromium plating.[16]

McNair[17] used a sulphate-free solution containing chromic acid (200 to 450 g./l.) and 1/3% of fluoride. This solution was operated at 86 to 90°F. (30 to 32°C.), and was maintained by periodically discarding parts of the electrolyte, and making up the bulk with new solution. *Dubpernell* and *Martin*[16] investigated many variations of solutions for barrel chromium plating, and found that a chromic acid bath containing fluosilicic acid and practically no sulphate was best.

Although barrel chromium plating is now well-established, it is important to note that a piece difficult to barrel-nickel-plate is even more difficult to barrel-chromium-plate. The work should preferably be nickel-plated (0.0001 to 0.0002 in. thickness at least) before chromium plating, but direct chromium plating is sometimes done. A plating time of ten minutes is generally used, and this gives an average thickness of bright chromium of about 0.000005 to 0.00001 in. The maximum plating speed is about 0.0001 in./hr., and any desired thickness may be obtained. Small parts ordinarily chromium-plated in a 16 in. barrel with a 10 in. track require a current of 200-300 amp. at 5-7 volts; temperature of the solution is about 95°F. (35°C.). The cast and color of bright barrel chromium-plated work is slightly different from that of racked or basket plated parts.[16]

The S. R. H. S. bath is claimed to be particularly suitable for barrel plating because its self-regulating characteristics reduce the control problem introduced by high drag-out losses.[8]

Comparative Physical Properties of Chromium Deposits

Very little comparative data is available on the physical and mechanical properties of chromium electrodeposited in baths of various compositions. It seems, however, that deposits obtained in baths containing fluorides or fluosilicates compare favorably with those obtained from sulphate baths, and they should be satisfactory in most applications.

No great differences have been reported in the hardness of electrodeposits obtained from baths of different compositions. *Brenner*[10] states that the composition of the bath has only a minor effect on hardness compared with the effects of temperature and current density, although his experiments indicate that deposits from fluoride baths may be harder than those from sulphate baths.

Eilender[18] compared the hardness of deposits obtained from baths containing: (a) sulphuric acid, 1% and (b) sulphuric acid 0.2% plus fluosilicic acid 1.8%. In the sulphate bath the hardest films were the brightest, but in the fluosilicic acid bath, bright films were only obtained at high temperatures, when the hardness was below the maximum of 950 D.P.N. The range of operating conditions within which hard coatings could be deposited was much narrower in fluosilicic acid baths than in sulphate baths.

Comparative wear resistance of deposits under service conditions is not known, but *Wahl* and *Gebauer*[19] reported that in a simple laboratory test the deposits from the sulphate bath had slightly better wear resistance than those from fluosilicic acid baths.

Chromium deposited on cylinder bores requires porosity for retaining lubricating oil. According to *Gebauer*,[20] the finest porosity is produced in hydrofluoric-fluosilicic acid baths followed by sulphuric acid-fluosilicic acid baths; sulphuric acid baths give coarse porosity.

Disadvantages of Solutions Containing Fluorides or Fluosilicates

Solutions of this type have not been widely used outside Germany despite their important advantages, mainly because they are very active chemically and may cause corrosion of the work being plated and the equipment. Control is also more difficult than with the conventional chromic acid/sulphate bath. Solutions containing fluosilicic acid alone as catalyst dissociate fairly rapidly with the passage of current, but dissociation can be retarded, although not entirely suppressed, by adding small amounts of sulphuric acid. Colloidal silicic acid is formed, and this acid causes dull grey or brittle deposits. Free hydrofluoric acid is also formed; this acid causes pitting corrosion of the work being plated, and it also attacks the tanks and racks. In German shops, the baths were diluted from time to time and brought up to strength again by the addition of chromic acid, or completely new baths were prepared, in order to reduce corrosion. This practice was, of course, expensive and a considerable disadvantage in commercial operation. *Gebauer* and *Sommer*,[14] however, investigated practice in commercial plating shops in Germany, and found that these methods were not necessary. They established by experiments, both laboratory and large-scale, that baths containing both fluosilicic acid and sulphuric acid had a life just as long as baths containing only sulphuric acid, provided the baths were operated correctly, and contamination with iron or other substances avoided.

Etching of the work may also occur when hard chromium plating in these baths, and preventive measures must be taken.

Conclusion

Chromium plating baths containing fluorides or fluosilicates have several advantages over the conventional bath containing sulphuric acid, the most important being faster plating speed. Baths of this type were widely used in Germany, but reports on their success are conflicting, and experience there did not suggest that they will replace chromic acid/sulphate baths in other countries. Corrosion of the work being plated and of the equipment and the greater difficulty of control have been the strongest deterrents to their use.

Barrel chromium plating is an application where solutions containing fluosilicates have firmly established themselves, mainly because of their better throwing power and higher efficiency.

The development of a chromium plating bath more efficient than the conventional chromic acid/sulphate solution is particularly desirable at present because of its potential value in making practicable the use of chromium coatings in place of nickel, which is in short supply. Promising advances in the development of bet-

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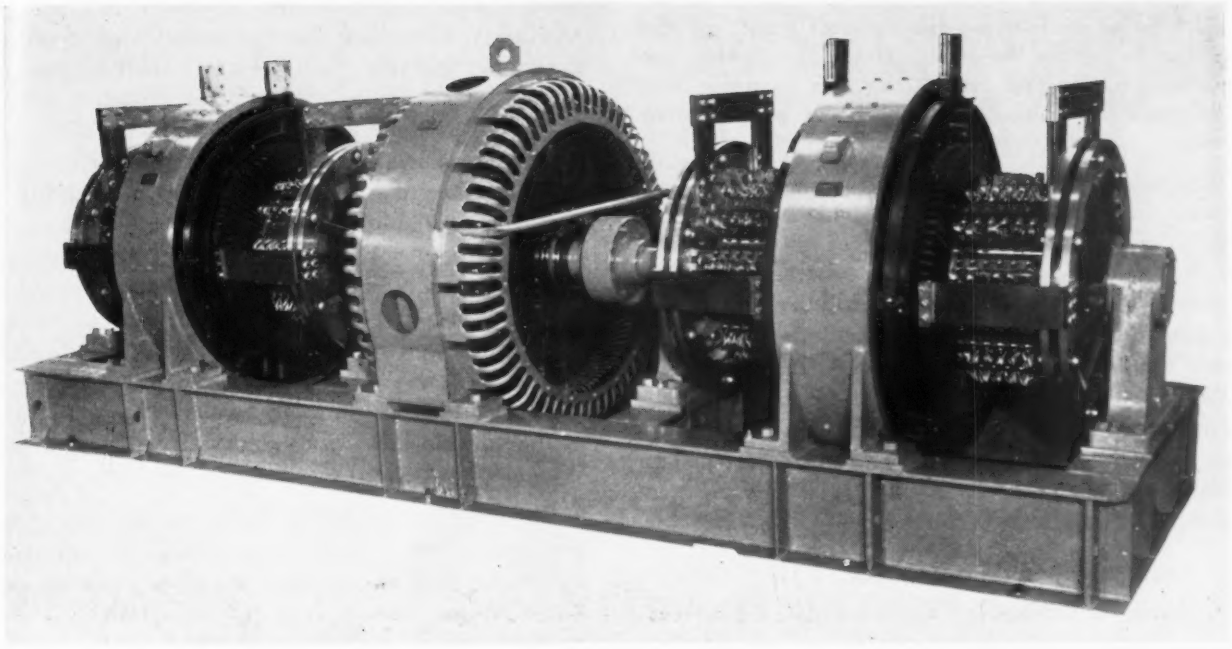

Brush Selection and Maintenance for Electroplating Generators

By A. I. Caplow and H. W. Sussman, *Columbia Electric Mfg. Co., Cleveland, O.*

WHEN the design engineers select a grade of brush for a particular low voltage generator, they take into consideration the design constants of the machine, the voltage of the generator, the resistance of the brush materials, the film-forming ability of the brush, and the polishing action of the brush.

The film-forming action of the brush has to do with the lubrication between the brush and the commutator. If the brush does not form an even film on its face and the surface of the commutator, the mechanical coefficient of friction between the brush and the commutator will be high. If the brush forms too heavy a film on the commutator, the electrical resistance between the face of the brush and the commutator surface will be high resulting in a poor contact between brush and commutator. Either of these conditions will cause excessive heating.

It is apparent that the proper grade of brush will be one which will form the right degree of film on the commutator, and maintain that film by the slight polishing action of the brush. As mentioned above, too heavy a film will result in heat because of a high contact drop. If, after a film has been formed on the commutator, the film starts to break down, heat is generated due to mechanical friction and selective action. Either of these conditions will cause sparking between the brushes and the commutator and result in undue wear of the brushes and commutator. In addition, the commutator surface will become rough, threaded or marked and will gradually deteriorate to the point where it will be necessary to turn or resurface the commutator. Sometimes the commutator film will break down under some brushes and not under others. When this occurs, those brushes under which the commutator film has broken down tend to hog more load than the other brushes.

Selective Brush Action

The tendency of some brushes to take more load than other brushes is known as selective action. In some cases this is self-correcting because those brushes carrying more load will tend to form more film on the commutator. However, if this condition is not self-correcting it can only be corrected by removing all the film from the commutator and brushes by means of a light commstone thus permitting a new uniform film

to build up. Selective action may occur if the generator is constantly operated under an underloaded condition. The remedy here is to lift one brush from each brushholder so as to increase the current density of the brushes in service to about 80 to 90 amperes per square inch. Constant overloading of a generator may also result in breakdown of the film and selective action.

Selective action is also caused by uneven spring tension on the individual brushes. This is particularly true in a low voltage generator because of the large number of low resistance brushes operating in parallel. Contrary to what one might normally expect, insufficient spring tension will cause the brushes to wear faster than too much spring tension. It is therefore imperative that as the brushes wear the spring tension be adjusted to maintain the recommended spring pressure as given in the manufacturer's instruction booklet. This tension should be approximately 3½ pounds per square inch.

Lifting Brushes

In lifting the brushes in order to increase the current density of the remaining brushes, it is suggested that the brushes be lifted around the commutator to give a uniform amount of brush area over the entire commutator surface. For example, assume a commutator had seven narrow boss and seven wide boss brushholders, each brushholder having six brushes, (see Figure 1). If you numbered the brushes in each box 1, 2, 3, 4, 5 and 6, and numbered the brushholders 1 through 14, then the following brushes would be lifted:

Brushholder No.	*Lift Brush No.*
1W	1
2W	1
3N	2
4N	2
5W	3
6W	3
7N	4
8N	4
9W	5
10W	5
11N	6
12N	6
13W	1
14N	2

The letters W and N following the brushholder numbers indicate the narrow and wide boss on the brushholders. You will find upon examining the generator that there are two different sizes of brushholders used. Two adjacent brushholders will have wide bosses and the next two brushholders will have narrow bosses. The boss is that section of the brushholder which is attached to the rocker arm. The use of narrow and wide boss brushholders is one means of obtaining the proper stagger of the brushes over the commutator surface.

Caution: The number of brushes removed from each brushholder and each commutator must be the same.

From the foregoing, it is apparent that proper film on the commutator must be maintained at all times in order to have successful operation and long brush life. Obviously, this means that the commutator should be kept clean and free of any contamination such as oil, abrasive dust, dirt, smoke or fumes. Abrasive dust or dirt (such as cement) is particularly harmful because it may permanently settle in the brush face and because of its hardness cut the commutator. Once such dirt is embedded in the brush face it may continue to recede into the brush as the brush wears. Fumes which are prone to attack commutator film are hydrogen sulphide, sulphur, carbon tetrachloride, acid, cigarette smoke, chlorine, alcohol, alkali, and oil vapor fumes, to mention but a few. An atmosphere of low humidity will also cause film deterioration because of the reduction of the inherent lubricating ability of the brush due to the lack of moisture.

Under normal operating conditions, the face of the brushes will have a bright polish. When selection action occurs, the face of the brush will show black streaks. These streaks contain free graphite. They will also appear when excessive film occurs between the brushes and the commutator.

The contact drop between the commutator and the brush pigtail is normally in the order of 100 to 200 millivolts for the average brush in a 6-volt generator. Higher voltage generators may have brushes with a contact drop of as much as .2 to .7 of a volt. This contact drop is a variable depending upon the particular operating conditions. This contact drop increases in a vicious cycle with excessive film formation — that is, the more film, the more contact drop, the more heat generated, the more film formed, etc.

Cases have been known where the contact drop due to excessive film formation exceeded 1 volt on a 6 volt generator at rated load. When you consider that this drop existed on both the positive and negative brushes you immediately realize that ⅓ of the KW capacity of the generator was being dissipated in heat on the commutator and brushes.

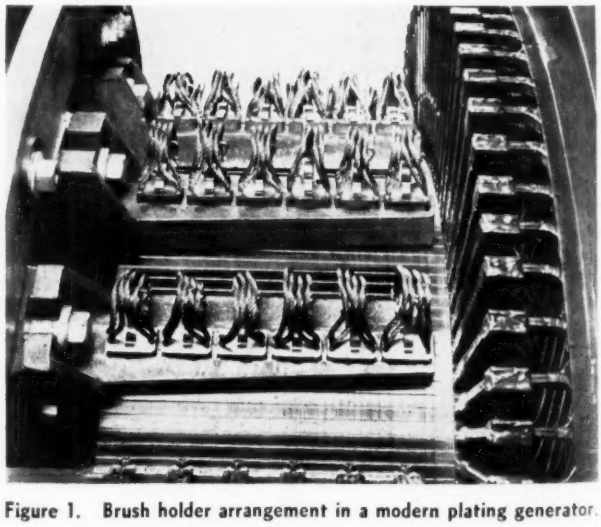

Figure 1. Brush holder arrangement in a modern plating generator.

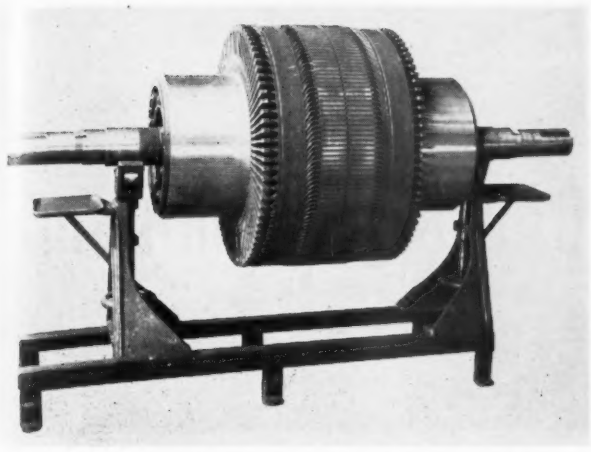

Figure 2. The commutator assembly is a bulky unit whose removal from the machine for refacing is a costly procedure.

From the foregoing, it should be apparent that every effort should be made to maintain the proper film at all times. It is suggested that a definite program should be established for the maintenance of every generator. This program should consist of the following:

1. Check the brushes periodically to make certain that they are loose and free in the holders so that they readily move up and down, thus enabling them to follow the contour of the commutator when in operation.

2. See that the slots of the commutator are not filled up with dust or dirt. To clean these slots a blower can be used. *Caution: Never put oil or vaseline on commutator.*

3. Periodically wipe off the accumulated dust and dirt from the generator. Use a vacuum cleaner to remove the dirt. If the generator should become exceptionally dirty the following procedure is recommended:

   A. If there are any other generators or electrical equipment in the room, same should be covered with drop cloths or papers so that the dust and dirt liberated from the generator being cleaned will not settle on the other units.

   B. Use a vacuum cleaner to pick up any loose dirt. Blow out the generator with an air hose and again apply a vacuum cleaner to the generator to pick up the dirt which was loosened by the air hose.

   C. The generator which has been cleaned should then be covered so that the dirt which is in the atmosphere will not settle back on the generator.

   D. After the dirt has settled, remove the coverings from the room and have them cleaned or throw them out depending upon the type of covering used.

4. As the brushes wear, adjust the spring tension of the individual brushes by moving the notch on the brushholder. This tension should be approximately 3½ lbs. per square inch. Please note that this is not 3½ lbs. per brush. To determine the correct pressure per brush, multiply the cross section area in square inches by 3½.

This pressure can be measured by means of a small spring scale which is looped underneath the spring at the point of contact and pulled until the spring tension is offset by the pull of the spring of the scale.

If the commutator becomes unduly rough or threaded, it may be necessary to turn the commutator in a lathe and undercut it. Normally this can be done by any competent service shop. After turning, the commutator should be undercut with a commutator undercutting tool. Be sure that all feather edge mica is removed.

5. In replacing brushes, use the same grade of brush as originally supplied with the generator. This is important. Under no circumstances should mixed grades of brushes be applied to a generator.

In replacing brushes for the first time, it is suggested that all of the brushes be removed and a complete new set installed. Save those old brushes which are not entirely worn for replacements as needed. This recommendation is made because the brushes which are removed will have the proper film and contour. When the second set of brushes begins to wear, you will be able to use as a replacement, a brush which is already worn to the diameter of the commutator and which has the proper film.

6. On a double commutator machine do not replace the brushes on one commutator without making a similar replacement on the other commutator. If this procedure is not followed you may run into trouble because the brushes on the new commutator will not be properly seated and as a result may not take their proper share of the load, resulting in excessive load on the other commutator.

7. In putting in a new set of brushes, be sure that the brushes move freely and easily in the brushholder and that there is a good contact between the terminal clip on the brush and the brushholder. The brushes which most manufacturers furnish as a replacement have a contour on the face of the brush to conform to the approximate commutator diameter. However, it is necessary that the brushes be sanded in slightly in order to obtain the exact contour.

After a new set of brushes have been installed watch the generator for any undue heating of the brushes. If undue heating occurs this may be due to improper film formation between the brush and the commutator. To remove this improper film use an extra fine commstone on the surface of the commutator running the commstone across the commutator three or four times. The new film will then begin to form with load.

The authors, in presenting the above have purposely avoided going into any exhaustive discussion on commutation, the theory of brush contact between commutator and brush, film composition, etc. The article is primarily intended to give the average operator a general idea of the problems associated with low voltage generator brushes, especially of the metallic graphite type.

Some Notes on Hard-Coating Aluminum

By Herbert E. Horn

ALUMINUM, given a hard surface coating by means of a newly developed process, can often replace costly machined steel parts for wearing surfaces. The coated surface is file hard and has excellent resistance to corrosion. It is also a very good insulator.

Many uses will be found for this new process in seeking a means for better functioning, reduced weight, and lowered cost.

The hard coating process applies a hard *oxide* coating to the surface of aluminum. The oxide coating is produced by immersing the part to be coated as the anode into an electrolytic bath. The color of the coating will vary in appearance from light grey to black, depending upon the alloy used and the thickness of the coating.

Upon examination of cross sectional areas, it has been found that the coating develops in such a way that it builds half inwardly and half outwardly from the original surface. To show this effect, for example, should a coating of .002″ be desired, .001″ build-up of the outside dimension will result. As can be seen, a machined part to meet a final accurate dimension would have to be machined .002″ undersize to allow for the .001″ dimensional increase for *each surface*. A hole, therefore, would be drilled or reamed .002″ oversize from the final desired measurement to allow for .001″ buildup on each wall.

A series of tests to determine the smoothness of the coating as compared to the original surface were conducted. Utilizing the Profilimeter as a means of measurement, the hard-coated surface was found to have about the same surface smoothness as the bare metal With various samples of sheet stock, the surface was 10-12 rms. before the coating, and afterwards the surface was 15-18 rms.

Hardness of the Coating

The coating produced by the new process was checked to determine its actual hardness. A specimen of 61S-T6 aluminum was processed so that one part of its surface would be coated and the other part of the surface masked. By utilizing micro-hardness testing equipment, the hardness of the coating was accurately determined.

A hardness of 530 V. P. N. (Vicker's Pyramid Number) was evidenced, using a 200 gram weight and imbedding the test diamond into the coating for 30 seconds. This degree of hardness is equivalent to 51 Rockwell-C, and approximately 250,000 p.s.i. Tensile Strength. As can be seen, the hardness is equivalent to that of hardened tool steel.

The hard coating was also tested with a file and

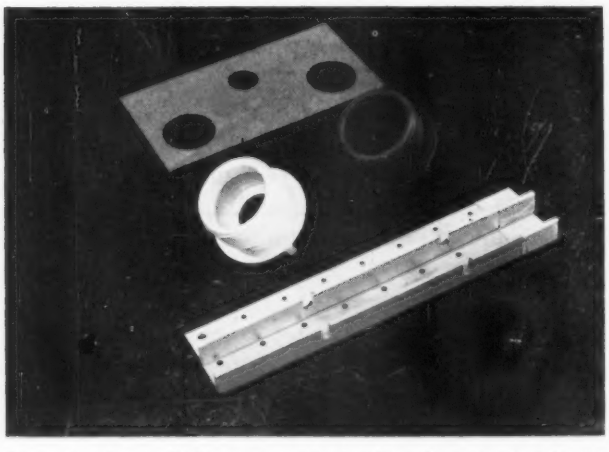

Figure 1. Some of the many parts that have been treated in the new hard-coating process. Upper-cast aluminum; middle-machined aluminum; lower-extruded aluminum.

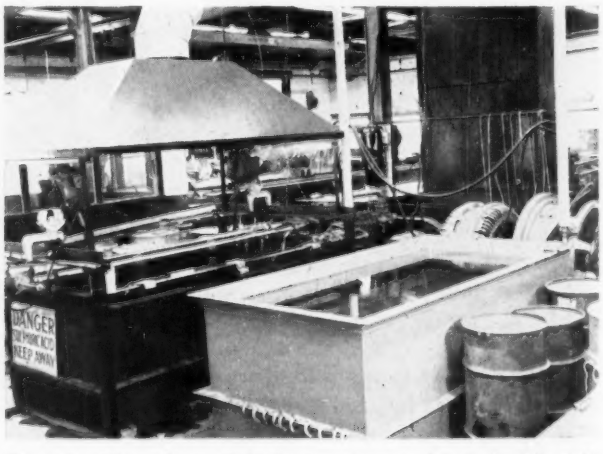

Figure 2. View of one of the hard-coat processing tanks. The bath is heated by submerged lead coils, and is provided with agitating propellers as shown.

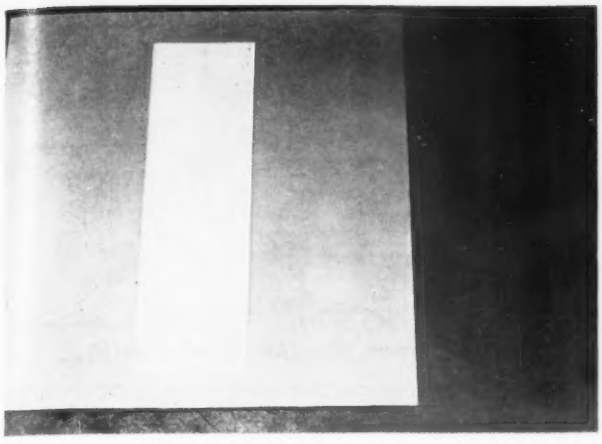

Figure 3. Showing the effect of the hard-coat film thickness on the final color of the coating. The right end of the large sheet has had a .002" coating. The thin strip in the middle is uncoated, and the balance of the large sheet has had .001" of coating.

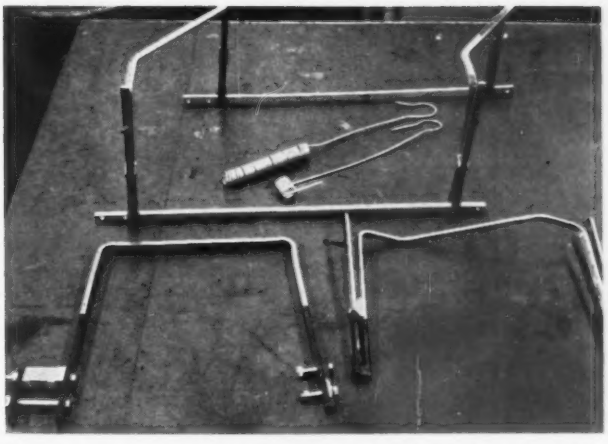

Figure 4. Several types of clamps used for holding the parts rigidly during the hard-coating cycle. The clamp-type is used only for the thickest parts, as the clip-type leaves less of a mark where the coating is not present.

found to be file hard. The surface of the coating was not marred or scratched by repeated strokes with the file.

Resistance to Corrosion

Corrosion and rusting have presented many problems in design and use of aircraft parts. However, the aluminum part that has been hard coated has exceptional resistance to corrosion, since the thick oxide layer is inert to corrosion elements. Test panels that were hard coated have not shown the slightest sign of corrosion under salt spray tests for over six hundred hours of exposure. This corrosion proofing, along with the hard surface, may provide many a use around nautical areas.

No Warping During the Process

Aluminum parts are not warped or distorted in the hard coating process, save for the surface buildup, which is uniform. On the other hand, many steel plates or jigs which have been machined to size, warp and distort upon subsequent heat treatment. To designers, this warping effect presents a considerable problem.

With the same part made of aluminum and machined to allow for the buildup for a desired coating thickness, the part will be the desired finished product upon emerging from the hard-coat processing tank. No further heat treating, re-aligning, or shaping is needed.

Heat Resistance

Aluminum should not be heat treated following the application of the hard coating. All tempering should be completed prior to the coating process, as extreme heats will effect the wearing qualities of the coating.

Experiments were conducted on the effect of heat treatment subsequent to the hard coating process. Three different specimens were coated: 14S-T4 alclad, 61S-O, and 61S-T6. Control strips were shared from these hard coated specimens for reference purposes.

The 14S-T4 alclad specimen was subjected to annealing conditions where the temperature reached 775° F. Upon re-examination of the coating, this specimen experienced a reduction in abrasion resistance of 53%.

The 61S-O and the 61S-T6 hard coated panels were heat-treated at a temperature of 970°F., followed by a water quench. Both of these panels had a 60% reduction in the wearing qualities.

Operation of the Hard-Coating Process

Processing the work involves a knowledge of the capabilities of the equipment, so that the work pieces are coated to the degree required.

The parts will be coated all over, save where the clamps are placed for contacts. The time involved to mask and to strip the unnecessary areas for hard-coating will be an added expense. As an alternative, the areas that were coated, but were not required, could be painted to improve the appearance of the finished product. Should it be desired that the coating be produced all over the surface, with no clamp marks showing, extra sheet metal could be designed on the item for the purpose of contacts which could be cut off afterward. This would leave the exposed area of the cut, but this could be placed in a location where it is of little importance. Vinyl-type masking "paints" and electroplaters' masking tapes are both suitable as stop-offs for the hard-coating process.

The processing solution requires a high degree of agitation to produce a good coating. As a consequence, the work pieces must have clamps or clips that meet two requirements: the work must not move in the solution so as to swing and touch each other or the cathode; also, perfect electrical contact must be maintained between the piece and the anode rods.

Clamps have been designed to meet both of these requirements and which are very versatile. One type is the screw-pressure type, which has a minimum of clamp immersed in the solution. This type can be used on parts from sheet to parts 1" thick. Another type is the bolted-lever, which has its entire mechanism in solution, but can accommodate wide parts.

Spring clips have been found satisfactory for light, small area work. This type has an advantage over the others in that it leaves a minimum of exposed area on the work. As can be seen, the contact of the clamps to the anode bars have to be perfect. The spring clips have the bent rod clip which can be wired tightly.

Alloys for Coating

Most aluminum alloys are suitable for the application of the hard coating. However, some alloys have

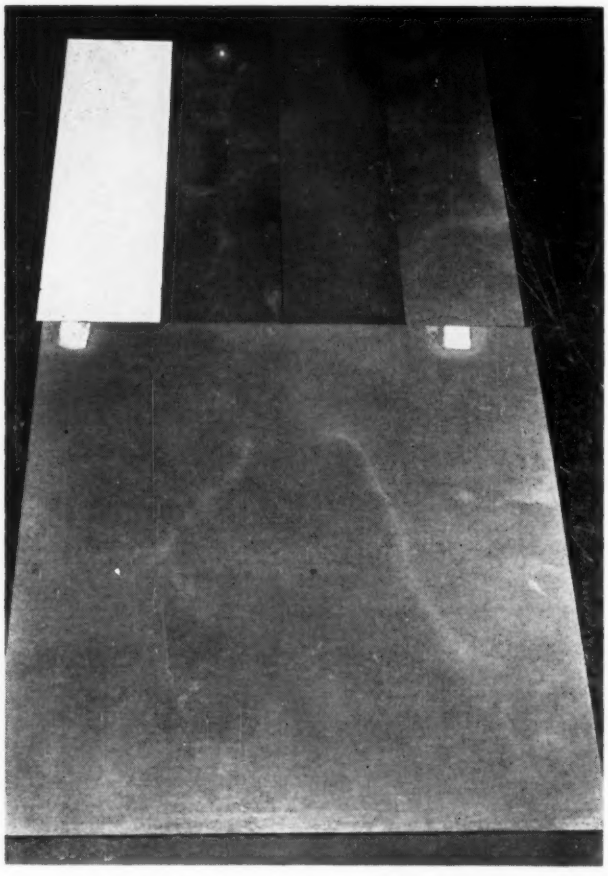

Figure 5. Coated 24S-T panels show an uneven coating effect due to the high copper content of this alloy. Generally, high copper or high silicon alloys are not suitable for satisfactory hard-coating.

characteristics that are not suitable due to the alloying constituents. The most favorable alloys for hard coating are those which contain less than 3% copper and less than 7% silicon.

The alloys that have been tested to date and found to be satisfactory are listed in the following chart:

Wrought Alloys	*Sand-Cast Alloys*	*Die-Cast Alloys*
2S	43	43
3S	214	214
52S	F214	218
61S	220	
75S	355	
All Alclads	356	
	645	

Applications for the Hard Coating

Aluminum extrusions that were to be used for tracks were hard-coated and were made to resist wear. Tool and jig designs have utilized the hard coating to replace steel bushing inserts for holes in cast aluminum fixtures. Die-cast aluminum spirals used for movable runners were processed and protected from wearing. Sheet aluminum .030″ thick with dimensions 5 feet by 4 feet have had a wear-resistant surface applied to resist scuffing.

One particular aluminum casting was treated in which highly accurate holes for hydraulic pistons were to be produced that would resist the wear from prolonged piston oscillation.

The above applications of hard coating are only examples of the many uses in which this process has been utilized. Numerous possibilities are in the offing, such as outboard motor clamps, aluminum tools, aluminum face plates, household gadgets, etc.

Considering the light weight of the finished product, the hardness of the surface, the resistance to corrosion, the insulating property, the absence of warping, and the smoothness of the surface, the hard coating process is an extremely valuable addition to modern manufacturing processes.

CHROMIUM PLATING BATHS

(*Concluded from page* 106)

ter chromium plating solutions have already been made, and further substantial improvements may be expected as a result of the experience now being gained in plating shops.

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Radiometric Study Of Phosphating Problems[1]

By Stanley L. Eisler and Paul G. Chamberlain[2]

Stanley L. Eisler

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Mr. Chamberlain for the past four years has been engaged in research in the Metal Finishing Section of the Rock Island Arsenal Laboratory, Rock Island, Ill. He received his B. S. degree in chemical engineering from Oklahoma Agricultural & Mechanical College in 1936. Previously he was engaged in chemical engineering work in the Portland Cement Industry.

Paul G. Chamberlain

Abstract

A number of problems pertaining to the phosphating process were investigated employing radiometric techniques. Results indicated that 1) Iron from the solution becomes an integral part of the phosphate coating; 2) residual phosphate was present on work after grit or sandblasting; 3) Re-phosphating after grit or sandblasting resulted in a lower process efficiency than after chemical removal of the original coating.

THERE are a number of questions pertaining to the phosphating process which have remained unanswered for lack of adequate chemical techniques which would provide the desired information. Therefore, it was deemed advisable to apply the use of radiochemical techniques to the possible solution of these problems.

Information as to the function of the iron in the phosphating solution has been indefinite as to whether some of this iron entered into the phosphate coating or not. By the use of a bath containing radio-iron, it should be possible to trace the action of the iron initially in the bath as differentiated from the iron dissolved from the work.

The fact that lower coating weights have been generally obtained on re-processed work, as compared to work phosphated for the first time, is a phenomena which has been unexplained up to the present time. It was believed that this might be due to residual phosphate remaining on the work after sand or grit blasting. Normal methods of measurement were found insufficiently sensitive to determine the small amount of phosphate remaining. However, it was believed that the much greater sensitivity of the radioactive tracer method would detect the presence of the residual phosphate.

The application of radiochemical techniques to the solution of the above problems, if successful, would indicate tremendous potentialities for the use of this method as regards the solution of other problems pertaining to the phosphating process.

Source of Iron in Phosphate Coatings

This problem was investigated to determine if the iron contained in a phosphating bath acts merely as a catalyst or enters into the process and becomes a part of the coating.

The radio-iron used for this investigation was purchased from the *Oak Ridge National Laboratory* by authorization of the Atomic Energy Commission, Isotopes Division. It was received in the form if iron powder containing an activity of approximately 0.06 mc. Fe^{59} and 0.05 mc. Fe^{55} per gm. The activity of the Fe^{55} was disregarded for the purpose of these tests, due to its disintegration by K-capture which is extremely difficult to detect by a customary Geiger-Muller counter set-up.

A 28 point phosphating bath containing one liter of solution was prepared. To this solution was added one gram of the radioactive iron powder to give an activity level of approximately 7×10^{-3} microcurie per milliliter. The counting rate of the solution was found to be 712 c/m per one milliliter aliquot. Ten 2″ x 3″ x 1/8″

1. *The opinions or assertions contained herein are not to be construed as official or reflecting the views of the Department of the Army.*
2. *Radiochemist and Chemist, respectively, Ordnance Corps, Rock Island Arsenal, Rock Island, Ill.*

1020 steel panels were grit blasted and then processed in the above bath for 30 minutes at 200°F. After processing, the panels were rinsed, dried and counted for five minutes each. Five panels were subsequently stripped in concentrated NH_4OH, dried and recounted.

The counting was done by centering the test panel on an aluminum plate held in a Lucite mount so that the upper surface of the panel was 10 mm from the window of the counter tube. The counter tube used was a Tracerlab TGC-2 tube with a window thickness of 1.8 mg./cm.^{2}

The results of this test are presented in Table 1. It will be noted from the average of 441 c/m that there has been a definite transfer of the radioiron from the phosphating solution to the coating on the panel. It is also significant that after stripping with concentrated NH_4OH, that the counting rate is reduced to the background count. This indicates that all the activity is definitely contained in the coating.

Four of the above panels were tested for corrosion resistance by subjecting two panels to the two hour salt spray test and two panels to the *Modified Van Loo* test![1] After these tests, the panels were again counted and the change in counting rate was found to be negligible. This indicates that the activity due to the radioiron was not held physically on the surface or it would have been removed by these treatments. Therefore, it has been proven that iron from the solution becomes an integral part of the coating during the phosphating process.

Removal of Phosphate Coatings

In the renovation of Ordnance materiel, it is very often necessary to remove the phosphate coating and re-phosphate the materiel. As has been previously mentioned, it has been found that this second treatment results in a lighter coating weight than that found on material processed simultaneously for the first time. This previous work involved grit blasting or sandblasting as the means of removing the phosphate coating.

It was believed that by the use of radiophosphorus in the phosphating bath, it would be possible to detect small amounts of phosphate remaining on the work after blasting. If it was found that an appreciable amount of phosphate was not removed, this could be considered a factor in decreasing the efficiency of the subsequent phosphating treatment.

Table 1

Radioactive Iron Content of Phosphated Panels

Panel No.	Net c/m after phosphating	Net c/m after stripping with conc. NH_4OH
1	436	
2	475	
3	430	
4	444	
5	469	
6	421	—4
7	443	0
8	431	—6
9	398	1
10	412	—4
	Average = 441	Average —2.6

Table 2

Residual Activity After Grit Blasting

Step	Average c/m	% Activity Remaining	Ratio to count after 1st Phosphating
After 1st Phosphating	14955		
After 1st Grit Blasting	1456	9.7	
After 2nd Phosphating	10420		69.7%
After 2nd Grit Blasting	2250	21.6	
After 3rd Phosphating	8852		59.2%

The radiophosphorus used for this investigation was received in the form of H_3PO_4 in 0.5 N HCl.

A 3000 ml. 28-point zinc phosphating bath containing approximately 0.1 microcurie of $H_3P^{32}O_4$ per milliliter was prepared and used for phosphating the steel test panels. The panels were all grit blasted prior to phosphating. After phosphating the panels were rinsed, dried and counted as previously described. The panels were then grit blasted and recounted. This procedure was followed for a total of three cycles. The results of this test are presented in Table 2.

It will be noted that an appreciable amount of residual activity was found after grit blasting, 9.7% after the first cycle and 21.6% after the second cycle. This indicates that a considerable portion of the phosphate coating is not removed by the grit blasting operation and must be considered as a definite factor in the reduced efficiency of the subsequent phosphating treatment.

The ratios presented in column 4 of Table 2 illustrate the reduction in coating weight, if it is assumed that a definite relationship exists between counting rate and coating weight. This fact was proven in another test where the ratio of counts per minute per milligram of coating weight was found to be reasonably constant as long as the bath was not adjusted by the addition of replenisher. These ratios are calculated using the counting rates as determined, and do not take into consideration the counts per minute due to the residual activity. Since it was not known whether or not the residual activity was removed during the subsequent phosphating treatment, a test was planned to answer this question.

Two groups of panels were phosphated in a bath containing radioactivity as previously described and counting determinations made. After grit blasting and counting, one group of panels was re-phosphated in the same bath, while the other group was rephosphated in a bath containing no radioactivity, and counting determinations were again made. The former group was then grit blasted, counted, re-phosphated in the normal bath and counted. The results of this test are presented in Table 3.

It will be noted that values of 90.3 and 87.1% of the residual activity for group 1 and 2, respectively, were obtained after phosphating in a normal bath. This indicates that the residual activity is not removed during re-processing, as the small reduction (approximately 10%) may be attributed in part to the masking effect of the normal phosphate coating over the residual

activity. Based on the results of this test, it was found necessary to subtract the counting rate of the residual activity from that of the subsequent phosphate coating prior to calculating the ratio. This makes it possible to determine a more accurate ratio of the counting rates of subsequent treatments to that of the orginal treatment. Correcting the results presented in Table 2 in the above manner, the ratios are reduced from 69.7 and 59.2% to 59.9 and 44.1%, respectively. The corresponding ratio of 2nd to 1st phosphating for the test results presented in Table 3 was 82.1% as compared to 59.5% noted for the first test.

The large difference in ratios may be attributed to a number of reasons, such as:

1. Changes in bath composition due to depletion and precipitation.
2. Slight increases or decreases in bath temperature during processing of test specimens.

Table 3
Removal of Residual Activity

Step	Average c/m Group 1	Average c/m Group 2	% Activity Remaining Group 1	% Activity Remaining Group 2
After 1st*				
Phosphating	5150	5077		
After 1st				
Grit Blasting	844	799	16.4	15.7
After 2nd*				
Phosphating	5072			
After 2nd				
Phosphating		696		87.1
After 2nd				
Grit Blasting	1012		20.2	
After 3rd				
Phosphating	914		90.3	

Ratio of 2nd Phosphating to 1st Phosphating of Group 1 (corrected for residual activity)—82.1%.

**Indicates bath contained radioactivity.*

In order to minimize the effect of the two factors mentioned in the preceding paragraphs, it was decided to use a bath of 10 gallon capacity. This bath was of approximately the same concentration and contained approximately the same level of radioactivity as the smaller bath used for the previous tests.

Chemical Removal of the Coating versus Physical Removal

At the same time removal of the coating by various chemical treatments was studied. The solutions used for removal of the coating were cold concentrated NH_4OH, cold 10% NaOH and hot 20% CrO_3. The test conditions were similar to those previously described, as all panels were grit blasted prior to the initial phosphating treatment and then put through three cycles of phosphating with intervening removal of the coating. Weight measurements were also made to determine coating weight and iron loss. Sandblasting and grit blasting were employed as physical means of coating removal in addition to the three chemical methods mentioned above.

The results of one of the tests conducted are presented in Table 4 where the average values are presented for each group of ten panels chemically treated. For the sandblasted and grit blasted groups, 20 panels each were used. After each phosphating treatment, five panels were chemically stripped and weighed to determine the coating weights and iron losses so the averages of the counting rates represent 20, 15 and 10 panels for cycles 1, 2 and 3, respectively.

Table 4
Chemical Removal of the Coating versus Physical Removal

Cycle	Coating Weight	Ratio of 1st Phos. Count	Ratio of 1st Phos. Weight	% Activity Remaining	Fe Loss
Sandblasted:					
1	.0574			17.5	.0257
2	.0674	106	117	45.7	.0283
3	.0815	95	142	39.2	.0537
Grit Blasted:					
1	.0560			28.2	.0268
2	.0868	134	155	23.2	.0363
3	.0781	115	139	42.6	.0386
NH_4OH Stripping:					
1	.0558			0.0	.0261
2	.0901	163	161	0.1	.0221
3	.0816	156	146	0.5	.0241
NaOH Stripping:					
1	.0535			0.0	.0225
2	.0791	147	148	0.3	.0202
3	.0738	146	138	0.1	.0222
CrO_3 Stripping:					
1	.0559			0.0	.0258
2	.0879	161	161	0.4	.0226
3	.0832	157	149	0.2	.0253

The following salient facts may be noted from the results presented in Table 4:

1. The variations in bath concentration and temperature previously mentioned caused such a change in coating weights and counting rates that the ratio of subsequent treatments to the original treatment are meaningless.

2. The residual activity after the physical removal treatment was as high as 45.7% in one case, while all the chemical removal treatments showed practically zero residual activity.

3. Close agreement was found between ratios based on coating determinations and those based on coating weights in the case of the groups employing chemical treatments for removal. This was to be expected as previously has been shown, since if the bath is not changed by dilution, the counts per minute per milligram of coating should remain constant. This, however, assumes that the phosphate in the coating is in the same chemical compound. The variance between the two ratios for the physical treatments may indicate the formation of compound other than tertiary zinc phosphate, due to the residual phosphate remaining on the steel.

4. The iron loss on panels from which the coatings had been removed physically was generally higher than on the panels treated chemically, despite the fact that generally lower coating weights were obtained. This may be attributed to the dissolution of embeded silica particles from the panels during the phosphating process, which would contribute to the weight loss attrib-

uted to iron loss. The presence of the imbedded silica particles is discussed by *Gilbert*.[2]

Due to the fact that bath concentration and temperature variations were not eliminated by the use of the larger bath volume, another approach to the problem is required. An analysis of the data presented in Table 4 comparing the coating weights and counting rates for the various removal treatments for cycles 2 and 3 individually was made. This analysis is presented in Table 5.

Referring to Table 5, the following facts may be noted:

1. The efficiency ratings are comparative values based upon the coating weight or counting rate for the CrO_3 stripped panels taken as 100%.

2. Good agreement is noted in the efficiency ratings determined from both coating weights and counting rates in the case of chemically treated panels. However, this is not true for the physically treated panels where a considerable difference is shown. This may be accounted for by the possible formation of other compounds in the coatings, as previously discussed, which would make the coating weights greater.

3. Assuming the counting rates to be more representative of the true phosphate coating, it will be noted from the counting rate efficiencies that there is a decided decrease in the amount of phosphate on the panels phosphated after the two physical treatments.

Table 5

Coating Efficiencies after Various Removal Treatments

Treatment	Coating Weight	Net c/m less Residual	Efficiency Rating	
			Coating Weight	Counting Rate
Cycle 2:				
Sandblasted	.0674	1918	74.9	64.7
Grit Blasted	.0868	2406	96.5	81.2
NH_4OH Strip	.0901	2961	100.2	99.9
NaOH Strip	.0791	2677	87.9	90.3
CrO_3 Strip	.0899	2962	100.0	100.0
Cycle 3:				
Sandblasted	.0815	1733	97.9	60.9
Grit Blasted	.0781	2080	93.8	73.1
NH_4OH Strip	.0816	2835	98.0	99.6
NaOH Strip	.0738	2655	88.7	93.3
CrO_3 Strip	.0832	2844	100.0	100.0

4. The efficiency ratings definitely show the NH_4OH and CrO_3 stripping methods are best, the NaOH method is slightly inferior and the two physical methods are much inferior as regards the amountof phosphate which may be coated on the steel by subsequent treatments.

5. It may also be pointed out that the coating weights for cycle 1 shown in Table 4 were quite consistent for the five groups. This was also true for the counting rates, the averages of which for the five groups ranged from 1802 to 1819 counts per minute. This indicates that the variance in efficiency ratings noted above may be directly attributed to the method of removing the phosphate coatings between cycles.

Summary

The work previously detailed which employed radioisotopes as tracers has produced information which was not obtainable by normal chemical techniques. To summarize, it has been shown that:

1. Iron in a phosphating solution is taken up as an integral part of the coating.

2. The iron in the coating is removed entirely by chemical stripping which indicates that there was no transfer of iron from the solution to the base metal.

3. A considerable portion of the phosphate in the coating remains on the panel after grit or sandblasting.

4. Subsequent phosphate coatings after sandblasting or grit blasting previously phosphated work are not as efficient as those following chemical stripping.

5. Coating weights are not a true indication of the efficiency of a coating due to the formation of compounds other than usual. This was true following grit or sandblasting and may be attributed to the residual phosphate previously mentioned.

Past experience has shown that work reprocessed after chemical stripping generally results in an inferior coating as regards corrosion resistance. Further work is planned to substantiate these results. Therefore, any recommendation for the use of chemical stripping based on the results presented in this report will have to be deferred.

It is believed that the future application of radiochemical techniques to the study of phosphating problems should prove profitable in further clarifying the complexities of this process.

The authors wish to express their appreciation to their co-workers at the Rock Island Arsenal Laboratory for their assistance and to the Ordnance Corps, Research and Development Division of the Department of the Army and supervisory staff of the Laboratory for permission to publish the information in this paper.

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Fabricated Plastics In The Plating Industry

Raymond B. Seymour

By Raymond B. Seymour & Earl A. Erich, *The Atlas Mineral Products Co., Mertztown, Penna.*

Earl A. Erich

FROM its humble beginning to the present time, the plastics industry has been dependent to a large extent on techniques developed by the metal trade, as well as metal equipment such as presses, extruders and calenders. The plastics industry has borrowed many of its application techniques from the metal industry, but with the exception of supplying organic coatings, linings and plastisols, it has contributed very little in return until recently.

Today the plastics industry is repaying its debt by supplying plastic plating barrels, plastic tanks, plastic pipe and plastic duct systems to the plating industry. These structures are completely corrosive resistant throughout their entire thickness and when properly selected and designed will serve plating plants indefinitely.

Tanks

Self-supporting corrosion resistant tanks have been fabricated from phenolic, furane and polyester resins, polymethyl methacrylate and rigid polyvinyl chloride. The first three are thermosetting resins and hence are not deformed at elevated temperatures, such as that of boiling water. The last two are thermoplastic and should not be subjected to continuous service above 150°F.

Phenolic and furane resin tanks are usually cast from mixtures of the liquid resin and asbestos. These same resinous mixtures can be used to repair or modify tanks based on these materials. Both products are resistant to dilute sulfuric, hydrochloric and phosphoric acids, as well as to most corrosive salts and organic solvents. Furane resins are resistant to alkali in all concentrations whereas phenolic resins are attacked by caustic solutions.

Polyester tanks are light in weight and usually consist of a fiberglas mat-reinforced unsaturated polyester plastic. These tanks are more resistant to chromic acids and some other oxidizing solutions than phenolic or furane resins but are less resistant to organic solvents.

Structures based on rigid polyvinyl chloride and polymethyl methacrylate are inferior in heat resistance to those based on thermo-setting plastics, but have greater resistance to impact and corrosives. Small polyvinyl chloride tanks can be heat drawn and larger structures can be welded using techniques adapted from the metal art; heat guns that will deliver hot gases at temperatures as high as 700°F. at pressures of 40 psi. in the absence of flame are available in this country.

Welding of Plastics

The thermoplastic welding process was first employed successfully by *Reinhardt*, using Saran, and similar techniques were subsequently employed in Ger-

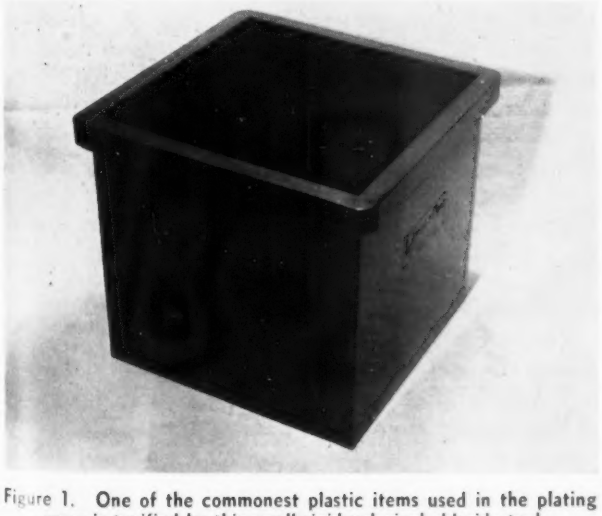


Figure 1. One of the commonest plastic items used in the plating room is typified by this small rigid polyvinyl chloride tank.

Figure 2. Operator is shown welding a corner joint in a section of plastic duct.

Table I

Typical Physical & Chemical Properties of Fabricated Plastics

Property	Phenolic	Furane	Polyester	Polymethyl Methacrylate	Polyvinyl Chloride	Poly-ethylene	Styrene-butadiene-acrylonitrile blend	Cellulose aceto-butyrate	Saran	Plasticized polyvinyl chloride
Thermoplastic	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Thermosetting	Yes	Yes	Yes	No	No	No	No	No	No	No
Max. Operating Temp. (° F.)	250	250	210	130	160	120	160	120	160	110
Tensile Strength (psi.)	4000	4000	20000	8000	9000	2500	5000	4000	5000	3000
Compressive Strength (psi.)	15000	15000	20000	12000	10000	2500	10000	10000	8000	3000
Flexural Strength (psi.)	6500	6500	10000	10000	16000	2000	10000	4000	7000	2000
Impact Strength (ft. #/in.) Izod ft. #/in.	0.3	0.3	0.4	0.4	0.55	16	7	3	0.6	12
Thermal Expansion (in/in/°F x 10^{-5})	3.5	3.5	3.5	7	7	14	3.5	7	7	10
Thermal Conductivity (Cal./cm./sec./° C.) (Cm.sq. x 10^{-4})	8.5	6	4	4	4	8	6	7	3	3
Sp. Gr.	1.7	1.7	1.3	1.2	1.4	0.9	1.1	1.2	1.7	1.3
Inflammability	Slow	Slow	Burns	Burns	None	Burns	Slow	Burns	None	None
Rockwell Hardness	R 110	R 110	M 85	M 90	R 120	R 11	M 60	R 60	M 50	-
Resistance										
Gasoline	R	R	R	R	R	C	R	R	R	R
Mineral Oil	R	R	R	R	R	C	R	R	R	R
Cleaning Solution	R	R	-	-	-	-	-	-	-	-
Toluene	R	R	R	-	R	-	-	-	R	C
Alkalies	R	R	C	R	R	R	R	R	R	R
Conc. HCl	R	R	R	R	R	R	R	-	R	R
5% Chromic Acid	R	-	R	-	R	R	-	-	R	R
Salt Solutions	R	R	R	R	R	R	R	R	R	R

LEGEND: R = Resistant C = Conditional — = Attacked

many by *Henning*, who used more readily workable polyvinyl chloride. Suitable techniques for the welding of polymethyl methacrylate and polyethylene were developed in Germany and in Great Britain respectively at least 10 years ago.

Plastic welding rod is usually an extruded spline of the same material to be joined, although sometimes it is advantageous to extrude a plasticized product for easy fabrication. The pieces to be welded should have their edges beveled at a 50-70° angle. The spline should be slightly larger than the chamfer formed by the parts to be welded for polyethylene and slightly smaller for more rigid materials which do not have such a sharp melting point. The temperature of the gun is governed by the material to be welded and must be hot enough to secure a strong weld, yet must not cause excessive decomposition of the plastic.

In the welding process, the spline is inserted with positive pressure perpendicularly to the chamfer, warmed to the recommended softening temperature, by directing the gun at an angle of approximately 30° to the sheet using a slight brushing action. As the spline or welding rod softens, the gun is moved progressively forward always keeping the spline and sheet in the same relative position. A properly formed plastic weld should have a strength of 80-90% of the non-welded sheet.

Pipe

Plastic pipe, a laboratory curiosity 20 years ago, now is considered as a standard material of construction for a large number of applications. As in the case of tanks, there is a division between thermosetting and thermoplastic products but a greater selection of plastic materials is available for pipe manufacture. Heavy corrosion-resistant pipe based on asbestos-filled pheno-

Figure 3. Welding a polyvinyl chloride curved duct section. Such welds are fairly easy to make, once the technique is learned.

lic and furane resins has been available for over 10 years. This pipe is usually joined by metal flanges which are attached by means of deep grooves around the circumference of the pipe. More recently, stronger pipe based on these plastics has been manufactured through the use of woven fiberglas as a reinforcing agent. Such pipe can be coupled using a short section of pipe of larger diameter held in place with resin cement based on the same material.

Fiberglas-reinforced polyester pipe is also being made commercially. This pipe has high impact resistance and sufficient solvent resistance to permit its general use in plating plant installations. Since all thermosetting plastic pipe can be made by spin-casting, mandrel-wrapping or casting techniques, the size and shapes that can be manufactured are almost unlimited. Standard thermosetting plastic pipe is available with inside diameters ranging from 4″ to 12″.

Since thermoplastic pipe is extruded, almost unlimited quantities of any particular size can be made once a suitable die has been designed and constructed. The physical properties of the thermoplastic pipe range from flexible polyethylene pipe to tough, heat-resistant rigid polyvinyl chloride pipe. Each type of pipe has specific characteristics but there is some overlapping

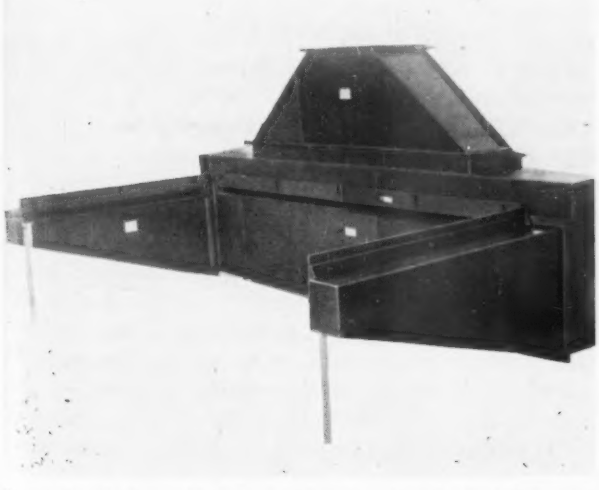


Figure 4. A three-sided fume exhaust system for installation on a plating tank. This construction is made of rigid polyvinyl chloride material.

properties and almost all types are adaptable to the plating industry. Extruded pipe based on the following materials is commercially available:

Polyethylene, Plasticized vinyl chloride-vinyl acetate copolymers, Rigid polyvinyl chloride, Blends of copolymers of styrene with acrylonitrile and butadiene, Polymethyl methacrylate, Saran and Cellulose acetobutyrate.

Extruded pipe is usually adaptable to metal pipe working techniques, such as cutting, threading and bending. It is preferable to use clean sharp cutting tools and dies with a rake angle of about 5°. High speeds and light cuts in the absence of lubricants are recommended for most machining operations. Bending is usually accomplished by heating the pipe in warm oil baths or air ovens using a rigid form of proper radius.

Thermoplastic pipe can be joined by the heat forming of a simple bell and spigot joint which can be heat or solvent-sealed. Hangers are recommended for above every 5 ft. of length of thermoplastic pipe. Slightly

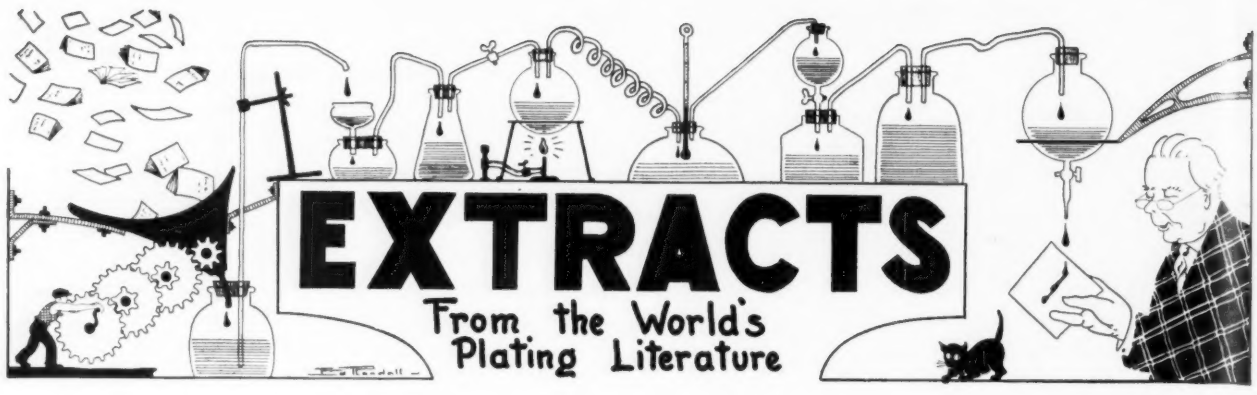
Figure 5. A section of a fume scrubber used in the chemical processing field.

larger distances may be allowed between supports for thermosetting pipe.

Hoods, Ducts & Ventilating Equipment

While alloy metal and thermosetting pipe have been used in some stack and hood constructions, the lighter construction made possible by the use of thermoplastic materials is preferred for the fabrication of fume exhaust hoods, collectors, stacks, tank covers, washers and plenum chambers. The methods of fabrication for rigid polyvinyl chloride and polyethylene structures are similar to those outlined under tank construction. The other materials are assembled using flanges, clamps or adhesives. There is a limited size of welded sections even with polyvinyl chloride and polyethylene and these sectional units are usually flanged and joined together with both or the same material.

Any of these materials may be repaired or modified on the job using techniques similar to those used in the original construction. Typical fabricated structures are shown in the accompanying photographs and typical physical and chemical properties of the available materials are outlined in Table I.



New Reagent Papers for Pore Testing of Plated Metals

Paper read by A. Kutzelnigg to April 1951 meeting at Stuttgart of Deutschen Gesellschaft Metallkunde (German Metals Society).

Up to now the testing of porosity in nickel coatings on steel have been conducted almost exclusively by means of the ferroxyline indicator. This method is by no means the ideal one to use. Only iron passing into solution is able to give the blue colored compounds which serves as the pore indicator, and a corrosive salt must be present. Usually the ferroxyl reagent contains as the corrosive medium, sodium chloride. A normal test composition is 10 grms. of potassium ferricyanide, 5 grms. of sodium chloride in a litre of water. The ferroxyl reagent can however attack the nickel also and so form blue spots, although at such points, no pores need have been present in the nickel coating.

It is stated that a better test method has been developed which shows up the pores in the nickel coating in an unequivocal manner. A reaction paper is used which is prepared with alpha-nitroso-beta-naphthol. This is called Porotest Paper 1. The alpha-nitroso-beta-naphthol gives with ferrous salts only a slightly soluble blue-green complex compound. The test paper is prepared by impregnation with a solution in an organic solvent, for example, methanol; it has been found that a solution concentration 0.5 grms./litre is sufficient. A light yellow colored paper is obtained which is stable on storage. The ferroxyl impregnated test paper is not stable. The Porotest paper is moistened with water and then placed on the surface to be tested. After a reaction time of 5 minutes, pores in nickel or tin plated coatings show up as bluish-green spots. As a result of the very low solubility, the effective amount of the reagent is so small that attack on the nickel coating itself is hardly likely to occur and in any case, nickel forms no complex compound with alpha-nitroso-beta-naphthol. The advantage of this solution is that a potassium ferricyanide test solution without the addition of a corrosive agent attacks neither the steel base metal nor the nickel coating while the potassium ferricyanide solutions with the sodium chloride addition, after a short time, give colored corrosion products both on steel and on nickel plate. As against this, a saturated aqueous solution of alpha-nitroso-beta-naphthol after 12 hours contact, is without visible influence on the nickel plate. Considerable doubt has been held with the Ferroxyl test with potassium ferricyanide for a long time, as neither agreement with the salt-spray test or with long-term natural corrosion is obtained. The present test method is considered ideal.

Organic reagents for testing pores in other plated metals can also be usefully employed. Pores in silver plated on nickel can be tested very conveniently by means of dimethylglyoxime paper. For pore testing of silver coatings on brass and copper, a test paper can be used which is prepared with Haematoxyline. This reagent is colored blue by brass or copper while silver causes no coloration. Similarly, with haematoxyline (logwood) paper, pores in copper or brass coatings on aluminum can be tested. Photographic reproductions in the original text, show how clearly the pores show up with the above test methods.

Effect of Foreign Bodies on Electro-Crystallization of Plated Metals

Paper read by H. Fischer to a Meeting of the Electrochemical Colloquium of Berlin Technical University.

The shape and orientation of the sub-individuals, i.e. the constituents of the block structure, change according to the nature and concentration of the inhibitors which cover the surface of the sub-individuals formed in a selective manner. With increasing inhibition, the shape of the aggregates which are formed from the sub-individuals, change with increasing covering.

The following types of growth forms are produced:

1. Field orientated isolation type. (FJ).
2. Base Oriented reproduction type. (BR).
3. Field oriented texture type (FT).
4. Non-oriented dispersion type (UD).

Twinned crystals are often formed by the transition from BR into the FJ type.

Fundamentally, with electrochemical crystallization, the electrodeposited metals develop according to the separtion conditions, the collective form types mentioned. They prefer, however, under definite conditions (for example, separation from aqueous electrolytes), to form definite types. It was shown that this preference depends on the inhibitor sensitivity of the metals, on the free surface energy and on the heat of fusion of the metal crystals. For research purposes, for the study of crystal formation of plated metals, the study of the electrolytic growth of single crystals is recommended. With polycrystalline growth, the growth competition of the single individuals has to be taken into consideration and quite often one crystal vanquishes another in this respect in the crystal growth front and then grows

at the expense of this other one. With the field oriented type of crystal growth, a competition of the growing sub-individuals would hardly appear to be a decisive factor. With electrolytic crystal growth, the definition of the current density is very indefinite. With the addition of inhibitors during the course of the electrolysis, no suddent changes in the crystal growth are caused but there is a slow transition. The inhibitors used in the research were selected from the viewpoint of constitution. Redox potential, polarity and dipole moment. As regards the influence of a special affinity between surface, atom and inhibitor, the special affinity of the inhibitor is obviously less decisive than the nature of the metal, i.e. the motion of the surface atoms and ions under the separation conditions.

Research on Electrotinned Steel Strip

V. Seul and R. Mintrop: *Stahl und Eisen*, vol. 70, No. 25, pp. 1154-1166.

Continuous strip electrotinning baths are first discussed. Modern practice has settled into the preponderating employment of the acid and alkaline baths and to a lesser extent the neutral tin bath. Normal operating temperature of the stannate bath is 60° to 80°C.; with current densities of 100 to 250 amps./sq. metre and electrode spacing of 10 cm., a voltage of 3-4 is required. The cathode efficiency is in many cases only 50 pc. of the theoretical; with high metal content, high bath temperature and low and accurately controlled caustic soda content, it can attain 90 pc.

The simple stannous-sulfate-sulfuric acid bath cannot be employed. The Schloetter phenol-sulfonic acid solutions give good results. Stannous sulfate solutions with the addition of sulfonic acids such as cresol, phenol or benzol-disulfonic acid do not work as well as pure sulfonic acid solutions because of the possibility of the formation of stannite salts. Schloetter who has worked on the acid tin baths since 1908 has succeeded in producing an acid tin electrolyte which produces particularly adherent, dense and smooth tin deposits with high permissible current densities and a considerable advantage is the particularly good stability of the electrolyte. The tin deposit from this solution is characterized by a very fine tin crystal grain size. The German references to this bath are given in the text.

The merits and drawbacks of the acid and alkaline electrotinning baths are discussed in detail. Advantages of the alkaline baths are better soldering properties of the tin coating, greater brilliancy and better corrosion resistance as a result of the self-cleaning effect of the alkaline bath on the steel strip. An advantage of the neutral and acid tin baths is the applicability of higher current densities with almost complete unity current efficiency and lower bath voltages which permit high throughput strip speeds with reduced tin bath length.

Steel compositions suitable for cold rolled steel strip for electrotinning are discussed. From the finishing line aspect, probably the only element here which has influence is copper. The copper is introduced into the steel as an impurity. The copper acts disadvantageously on the pickling and cleaning line properties of the strip as it can form copper-containing inclusions during the pickling. It has frequently been observed that steel from open hearth furnaces is tin plated with more difficulty as compared with a Bessemer steel and this is partly to be ascribed to the higher copper contents of the open hearth steels. According to recent research which is still being conducted, the nickel content of the steel also has significance in this respect.

Strip for electrotinning has exacting requirements as regards surface properties. To produce a plated tin coating as free from pores as possible, requires a pure steel surface which is free from pores and inclusions. These requirements are only fulfilled to a sufficient extent with a non-killed steel. The best electrotinned coating is obtained with a non-killed Bessemer steel. Continuous testing of the strip and sheet for strength and surface hardness, degree of purity and strip thickness is necessary.

Rhodium Plating

P. Hass: *Umschau*, vol. 5, No. 51, pp. 20-25.

The author found that electrodeposited rhodium is suitable for surface finishing and as a decorative, protective plate for less noble metals. In the powder form, rhodium has a light gray color and in the molten condition is pure white. The electroplating of the metal is relatively simple. To obtain good and trouble-free results, careful pickling, polishing and degreasing of the parts to be plated is essential. The rhodium plating is conducted at room temperature with 2-3 volts and 0.3 to 0.5 amps./sq. dm. (about 3-5 amps./sq. ft.) with the use of platinum anodes. Rhodium is deposited with an extraordinarily fine crystal structure. As base metals on which to plate, those particularly suitable are: silver and silver alloys, copper and copper alloys, brass, tombac alloy, and in addition, Alpaka and other nickel alloys, as well as gold, white gold and the platinum metals. Chromium, iron, zinc and tin, and alloys containing a high percentage of these metals are not suitable for direct rhodium plating.

Behavior of Plated Silver-Lead Alloy Bearings in I. C. Engines

M. Rossenbeck: *Zeitschrift fuer Metallkunde*, vol. 41, p. 109.

The running behavior of the plated bearings were examined under surface pressures of 135 and 190 kg./sq. cm. and at a gliding velocity of 10.6 metres/second. The adherence of the plated coatings was good and they did not loosen away under pressure. The copper coating was sufficient in order to prevent seizure when the overlying bearing coatings had been worn away. The dependency of the running properties and times on the lead content of the plated silver-lead alloy has not yet been clarified. Fatigue phenomena did not occur up to load figures of 47,410 revolutions.

With seized bearings there occurred a surface impoverishment in lead caused by oxidation or evaporation. The bearing play amounted to about 1 pc. of the crank shaft diameter. The bearing shafts were of hardened steel ECMO 100 and EC 100, ground and polished. The shaft journals showed only slight scores. Even with seizure, the bearing did not weld with the shaft. The tests thus served to show that bearings of this type run in a satisfactory manner under the conditions given.

Shop Problems

Abrasive Methods—Surface Treatments—Control
Electroplating—Cleaning—Pickling—Testing

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Bright Dipping Barrel Zinc Plated Parts

Question: When we try to barrel zinc plate some parts and then bright dip them we get a darkening in the recessed areas. These same parts, plated for the same time in the same solution or racks come out O.K. Can you tell us what may be causing this trouble?

B. P. J.

Answer: The problem undoubtedly lies in the thickness of the zinc plating in those recesesed areas. It is the age-old problem of not allowing enough additional time in the barrel plating process to get an equivalent thickness of plating. Some zinc is dissolved in the bright dipping operation, and if it is thin enough to begin with it is possible to remove it all and expose the steel underneath. The solution to your problem is in improvement of the barrel plating technique to give an adequate thickness of deposit in the recessed areas.

Hard Chrome Plating of Aluminum

Question: Can you tell us which alloy of aluminum is the easiest to hard chrome plate? We have a special application and would like to choose an alloy that will not be too difficult to handle in the plating department.

F. T. L.

Answer: (Hear! Hear! Ye Platers—Here's someone who actually worries about your problem before handing you the parts to work on!)

Undoubtedly the easiest alloys to plate, if they can be properly called alloys, are those which approach pure aluminum in composition, such as 2S or 3S. It is the alloy constituents in the microstructure of aluminum alloys that introduce special processing problems, and each class of alloy may require a totally different procedure. However, practically every alloy of aluminum has been successfully chrome plated and we refer you to the section in the *Guidebook-Directory* which gives the A.S.T.M. recommended procedures for plating on specific alloys of aluminum.

Adding Water to Blackening Baths

Question: We have just started to operate a blackening solution for steel, and the addition of water to keep the level up has caused us trouble, due to the spitting and bubbling that takes place. We tried running the water inlet pipe down below the surface of the bath, but that was even worse, nearly blowing all the solution out of the tank. What can you tell us to avoid this trouble?

H. A. P.

Answer: Never under any circumstances should the water be introduced under the surface of the hot blackening bath! The boiling point of the bath is in the neighborhood of 300°F., well above the boiling point of water, so the fresh water is immediately vaporized, which could cause disastrous results. The best way to add water is from an inlet whose end is well above the solution level and at one corner of the tank. The water inlet pipe can be surrounded by a sheet metal splash guard to confine the spattering and prevent splashing the hot alkaline solution around. Water should be added very slowly. A good idea is to install an automatic level controller on the tank, so the operator does not have to perform this unpleasant chore.

Recently Granted Patents
in the Metal Finishing Field

Patents

Iron Electrodeposition

U. S. Patent 2,583,100. *H. R. Wilson, assignor to Union Carbide & Carbon Corp.*

In the art of winning iron from an aqueous solution of an iron salt by the electrodeposition of the iron from the salt onto an iron cathode, the method of conditioning the cathode prior to deposition of the iron which comprises subjecting the cathode to the action of aqueous nitric acid only until brown fumes appear from the cathode surface and the surface is given an evenly etched matte finish and presents a dark film, and then preventing further action of the acid, the surface being free of such distinct crystalline etch as to be visible to the naked eye and the amount of treatment corresponding to the immersion of the cathode in an aqueous 5% to 15% nitric acid solution for from 10 to 25 seconds.

Polishing Wheel

U. S. Patent 2,583,632. *J. F. Coultier and I. J. Lupu.*

A polishing wheel comprising an annular core member, oblong polishing pads having a centrally located aperture and off-center apertures located on the long axis thereof, keys detachably attaching said polishing pads to said core member via the centrally located aperture of said pads, and means adapted to co-operate with the off-center aperture of said pads to position the long dimension of said pads parallel with the circumference of said core member, and arcuate cross-heads on said keys lying substantially in end to end relationship parallel to said core extending the long dimension of said pads at said core thus spreading said pads on a complete circumference at the periphery of said core from which circumference said pads are thrown radially outwardly by centrifugal force to form a complete circumference at the working surface of the polishing wheel.

Blast Cleaning Machine

U. S. Patent 2,584,587. *R. B. Huyett, assignor to Pangborn Corp.*

In a machine for blast treating laterally rollable flanged articles, a blasting chamber, a pair of work supporting screws extending longitudinally in said chamber, means or rotating said screws in the same direction, said screws lying substantially parallel to each other and presenting a notch or valley between the tops of their vanes for supporting the laterally rollable flanged articles with the flanges thereof descending between their vanes for causing them to advance lengthwise of said notch as they are rotated transversely therein, means for projecting blastant downwardly in said chamber in a fanwise stream directed longitudinally of said notch and against the upper sides of flanged articles being rolled and advanced therein, and baffle means for confining the stream of blastant for direct impingement thereof only against the top surfaces of said articles.

Constant Potential Plating

U. S. Patent 2,584,816. *M. L. Sands, assignor to the United States of America.*

An electroplating system for maintaining the potential between a plating solution and plating electrode substantially constant, comprising an electroplating cell including a container for an electrolyte, an anode electrode and a cathode electrode immersed in the electrolyte; a first thermionic tube having at least a cathode, anode, and a grid; means electrically connecting the electroplating cell anode and cathode, a source of plating potential and the anode and cathode of the first thermionic tube in series; means for varying the resistance of the first thermionic tube in a direction to remove variations in potential between the electroplating cell cathode and the electrolyte comprising means for supplying a constant reference potential; a direct current electronic amplifier having at least a first grid controlled thermionic tube and means electrically connecting the grid-cathode space serially with said reference potential supply means, said electrolyte, and said electroplating cell cathode; means coupling the output of the electronic amplifier across the grid-cathode space of the said first thermionic tube with that polarity which increases the resistance thereof upon an increase in potential between the electroplating cell electrolyte and cathode and decreases the resistance thereof upon a decrease in potential between the electroplating cell, electrolyte and cathode, whereby tendencies to variation of potential between the electroplating cell electrolyte and cathode are inhibited.

Electrodeposition of Neptunium

U. S. Patent 25,076. *G. T. Seaborg and J. W. Gofman, assignor to the United States Gov't.*

This description relates to a process for the electrodeposition of a material containing neptunium from aqueous solutions.

Neptunium-containing materials can be electrodeposited from an aqueous solution of a neptunium salt, when the aqueous solution has a pH between 2 and 7 and contains a neptunium salt and an alkali acetate. Suitable neptunium salts include the nitrates, chlorides, and sulfates. It is preferred that the neptunium salt in the aqueous solution have neptunium in a valence state greater than +4, i.e., neptunium be present either as monovalent neptunyl (NpO_2^+) or as divalent neptunyl (NpO_2^{++}) ions. The nitrates of these neptunyl ions, namely, neptunium dioxynitrate and neptunium dioxydinitrate are preferred. Examples of the alkali acetate buffer are sodium, potassium, and ammonium acetates. The amount of alkali acetate used is sufficient to maintain the pH of the aqueous solution preferably between 5 and 7. Two to 20 volts is preferred. Current

densities between 0.001 and 0.6 ampere per square decimeter have been found to be entirely satisfactory. The temperature of the aqueous solution during electrodeposition may be between 30 and 90°C.

Example I

A solution of a small quantity of neptunium, prepared by dissolving neutron-bombarded uranium in nitric acid, in an alkali acetate buffered aqueous medium having a pH of 5 and containing no carrier was subjected to electrolysis for two hours at a current density of 0.16 ampere per square decimeter and a potential of 8 volts, using a mercury cathode. Sixty-three per cent of the neptunium was found in the mercury, 6.5% remained in the aqueous electrolyte, and 31.5% was unaccounted for.

Example II

One-half cc. of a stock solution which was 0.001 M sulfuric acid solution and 15 cc. contained 1 microgram of Np^{239} as $Np(SO_4)_2$ and 0.2 mg. of lanthanum as $La_2(SO_4)_3$, and 1 cc. of acetic acid solution containing 0.02 cc. of glacial acetic acid were mixed with 3.5 cc. of water. The resultant solution was put in an electrolytic cell containing a platinum cathode and 57 volts was applied with a current of 0.010 to 0.012 ampere for four and three-fourths hours. There was a grey deposit on the cathode and the adherence of the deposit was fairly good. The cathode was measured for beta activity due to neptunium and it was found that 8.8% of the original neptunium in the solution had been deposited.

Example III

One-half cc. of the same stock solution used in Example II was mixed with 1 cc. of acetic acid solution containing 0.02 cc. of glacial acetic acid and 3.5 cc. of water. Two mg. of potassium bromate was added and the resultant solution was heated to boiling in order to oxidize neptunium to neptunium dioxysulfate (NpO_2SO_4). The aqueous solution was then cooled and placed in the electrolytic cell as used as Example II. It was subjected to 20 volts and a current of 0.06 ampere for two and one-fourth hours. The dark, adherent film on the cathode constituted 85% of the neptunium originally in the aqueous solution. Results of other examples show that too high an acidity will prevent electrodeposition of neptunium.

Lead Coating Process

U. S. Patent 2,586,142. *G. L. J. Bailey and H. C. Watkins, assignors to British Non-Ferrous Metals Research Association.*

A process for the production of lead coatings on solid metal surfaces selected from the group consisting of the ferrous and cuprous metals which in liquid lead show a contact angle greater than 50°, which process comprises dipping the solid metal in a bath of liquid lead containing nickel in solution from at least 0.01% up to as much as can be dissolved in the liquid lead, said nickel in such amounts having the property of reducing the contact angle to below 15°, the bath being substantially free from any metal capable of forming a stable intermetallic compound with the solid metal, and withdrawing the solid metal from the bath whereby a corrosion resistant continuous and adherent lead coating is obtained.

Steel Pickling Process

U. S. Patent 2,585,616. *M. D. Barnes, assignor to Sparex Chemical Co.*

The method of pickling iron which comprises contacting the iron and scale thereon with an aqueous solution of acidic material consisting essentially of sodium bisulfate and oxalic acid in contact with solid oxalic acid in excess of the amount soluble in the solution and maintaining the contact of the scale with crystals of the latter in excess of the amount soluble in the solution until the scale is dissolved.

Addition Agent for Tin Plating

U. S. Patent 2,585,902. *A. G. Gray, assignor to E. I. du Pont de Nemours & Co.*

In the operation of a tin electroplating process wherein tin is electrodeposited from an aqueous, acidic solution of stannous chloride having a pH between 2 and 5 and containing 2 to 12 moles of alkali metal fluoride per mole of stannous chloride, the improvement which consists in adding thereto 0.1 to 5 grams per liter of thiourea.

Vacuum Metallizing Process

U. S. Patent 2,562,182. *P. Godley, 2nd, assignor to National Research Corp.*

The process of vacuum deposition of a metal on a non-metallic, flexible substrate which yields gases or vapors

when heated, said process comprising the steps of passing said substrate through a heating zone evacuated to a pressure on the order of 50 to 500 microns Hg, heating both sides of said substrate during passage through said heating zone to drive from said substrate occluded gases and other volatiles resulting from said heating, said heating being of sufficient duration and intensity to remove volatiles from the body of said substrate as well as from the surface thereof, immediately thereafter moving said heated substrate from said heating zone to a cooling zone evacuated to a pressure lower than the pressure in said heating zone, providing a vapor barrier between said heating and cooling zones to prevent said evolved gases from entering said cooling zone and condensing on said substrate, cooling said substrate by at least 20°C. to prevent further evolution of gases from said substrate by passing said substrate in contact with at least one cooled surface in said cooling zone, said substrate being moved from said heating zone to said cooling zone and being contacted by said cooled surface prior to the time when the removal of volatiles is sufficient to cause substantial embrittlement of said substrate, passing said cooled substrate from said cooling zone into a coating zone evacuated to a pressure below about 0.5 microns Hg, vaporizing said metal in said coating zone, coating said substrate by condensing thereon said vapors of said metal, and shielding said substrate in said cooling zone from contact with metal vapors generated in said coating zone.

Plating Rack

U. S. Patent 2,562,683. *M. S. Schneider*

An article support adapted for quick attachment to the current-carrying metallic member of an electroplating rack comprising clamping members pivotally secured to each other and having substantially superimposed but slightly diverging U-shaped slots therein, the open ends of said slots being substantially equidistant from the pivot point and the pivot being displaced from the extended center line of at least one of the U-shaped slots, whereby when said members are forced onto a current carrier having a diameter corresponding to the width of the slots, the members will be wedged against the sides of said current-carrying member making a number of points of contact therewith.

Spot Gaseous Plating

U. S. Patent 2,587,036. *L. H. Germer and G. E. Reitter, assignors to Bell Telephone Laboratories, Inc.*

The method of plating objects each of which has a plurality of portions of surface which comprises enclosing a number of such objects in an enclosed space, establishing and maintaining a greatly reduced gas pressure in said space, injecting a stream of gaseous metallic carbonyl into a portion of said space, controlling the successive advance of said objects one by one to a position relative to the path of said stream such that the stream impinges upon a definite portion of said surface, establishing and maintaining the said portion of said surface of each object incident to such advance as it is moved to a point to be impinged upon by said stream at a temperature to decompose the metallic carbonyl at such portion of surface of each object in turn.

Forming Patina on Bronze

U. S. Patent 2,587,216. *M. Quardrio.*

A process for forming an ancient green patina on objects of bronze and brass comprising subjecting the object to be treated to a first dipping in a solution of potassium sulfied, then to a second bath of sulfuric acid, drying the object and dipping it in a third bath of sal-ammoniac, again drying the object in the air, and then subjecting the object to a repeated moistening on its surface by dabbing it with an applicator wetted in the solution of sal-ammoniac, applied by operating perpendicularly to the surface, following each dabbing regularly with a drying period in the air, until on the surface there are formed, over the ancient green back-ground, stains of a malachite green shade, then fixing the patina thus obtained with a solution of shellac in alcohol, applied with an applicator, completely drying the surface, and finally, applying a protective film of transparent nitrocellulose.

Chrome Plating Bath

U. S. Patent 2,587,651. *F. A. Rojas.*

A composition for use in a bath for the electrodeposition of chromium comprising the interacted mixture of (1) the aqueous reaction product of 400 grams of chromic anhydride, 41. to 267.5 grams of crystalline zinc sulphate, 12 to 81.4 grams of zinc oxide,

and sufficient water to dissolve the ingredients and permit their reaction, and (2) of 600 grams of chromic anhydride, 28 to 197.4 grams of barium carbonate, up to about 81.4 grams of zinc oxide, and sufficient water to suspend the ingredients and permit their reaction, the proportions of sulphate radical and barium radical being substantially equivalent.

Making Nickel Carbonyl

U. S. Patent 2,590,078. *A. Maeder, assignor to Ciba Ltd.*

A process for the manufacture of nickel carbonyl, which comprises heating a mixture produced by the action of an alkaline reacting substance selected from the group consisting of ammonia and alkali metal hydroxides upon a nickel salt and a member selected from the group consisting of nickel sulfide and nickel cyanide in an aqueous alkaline medium with carbon monoxide under a pressure range from 50 to 200 atmospheres to a temperature of 70-200°C.

Buffing Machine

U. S. Patent 2,587,776. *F. Slusher, assignor to The B. F. Goodrich Co.*

Apparatus for buffing an article having a flexible flange, said apparatus comprising rotatable buffing means, means for supporting and rotating the article at said buffing means with its flange near an operating face of the buffing means, means for effecting relative translational movement of said article and said buffing means, and means for directing a flow of fluid against the flange of the article for deflecting said flange into contact with said buffing means.

Corrosion Resistant Coating

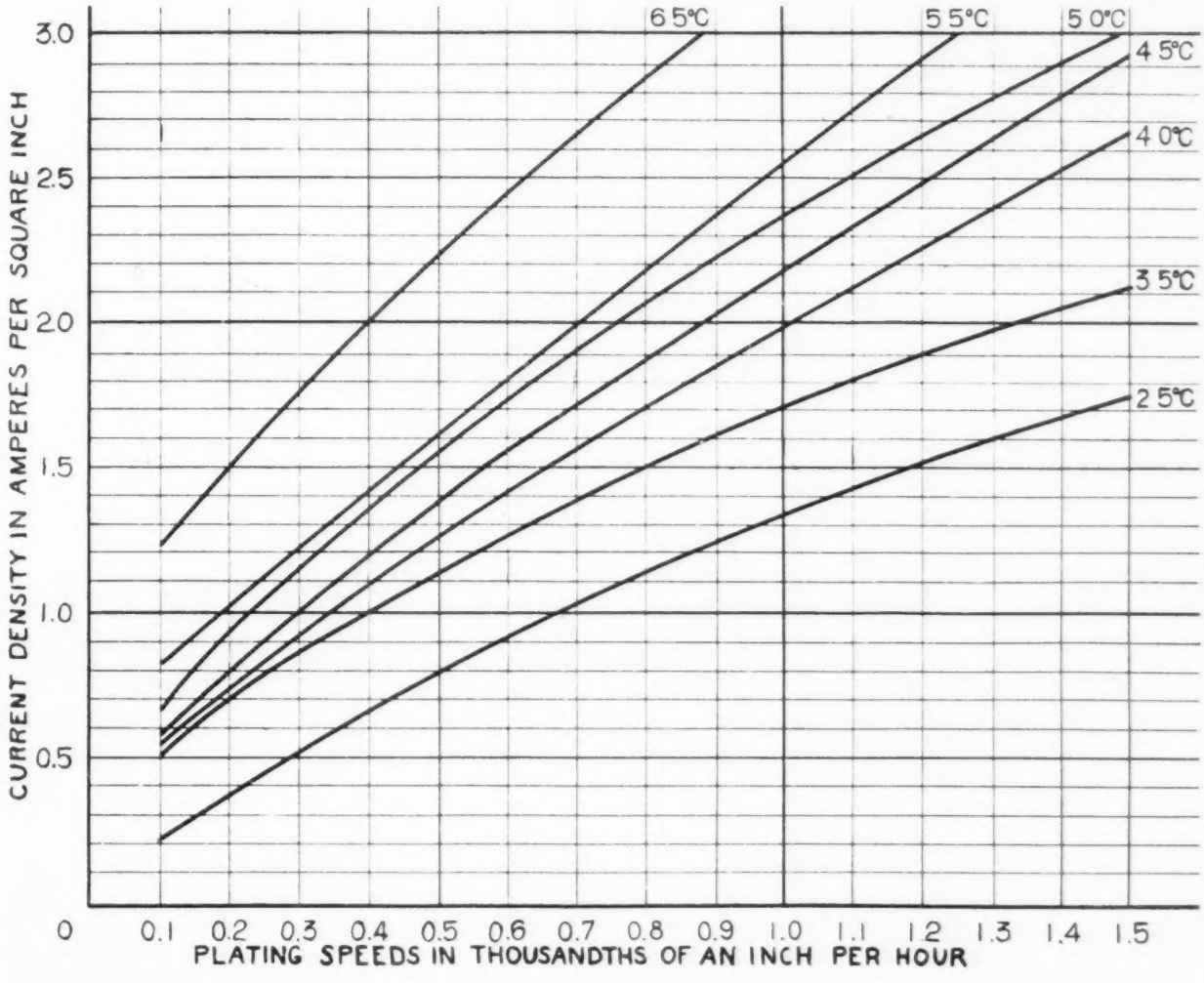
U. S. Patent 2,587,777. *C. W. Smith, assignor to Detrex Corp.*

A cleaning and corrosion resistant composition consisting of the following ingredients in substantially the stated proportions:

	Grams
Kerosene	80
Triethanolamine oleate	14
Cobalt naphthenate (Technical 6%)	6
Water	5–5000

Calculating Chromium Plating Speeds

The chart below gives average plating speeds for a bath containing 400 gm./l. of chromic acid, and a chromic acid-sulfate ratio of 100/1 at various current densities and temperatures. Plating speeds for the 250 gm./l. chromic acid bath are slightly higher for the same current density and temperature. (See May Data Sheet.)

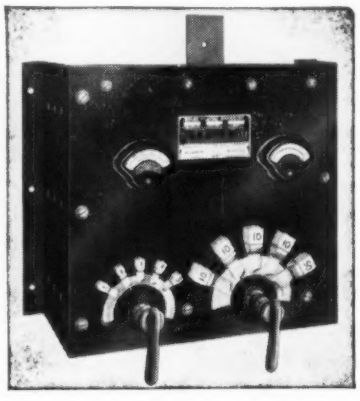


Recent Developments

New Methods, Materials and Equipment for the Metal Finishing Industries

Improved Rheostats for Accurate Current Regulation

Belke Manufacturing Co., Dept. MF, 947 N. Cicero Ave., Chicago 51, Ill.



The close amperage regulation essential to economical specification plating is provided by improved commutating rheostats announced by the above firm. In the 100 ampere rheostat illustrated, the left lever with circular blades selects any amperage from 1 to 9; the right lever any amperage from 10 to 90 in steps of 10.

To select 1, 2, 3 or 4 amperes, the left lever moves clockwise until the circular blade engages the required contacts. To select 5, 6, 7, 8, or 9 amperes, the left lever moves counter-clockwise. To select 10, 20, 30, or 40 amperes, the right lever moves clockwise. To select 50, 60, 70, 80, or 90 amperes, the right lever moves counter-clockwise. For example, to set the rheostat for 83 amperes, move the left blade clockwise to engage the first three contacts and the right blade counter-clockwise to engage the last contacts.

For rheostats of greater amperage, another commutating switch and/or regular knife switches are added to the 100 ampere controls.

The contacts engage the rotary switch blade on both sides for positive contact and self-cleaning, wiping action. The commutating switches are free from arcing due to the comparatively small amperage added by each contact.

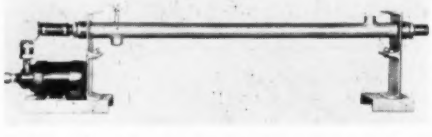
Helical-formed resistance coils of nickel-chrome alloy are vertically mounted with positive spacing for self-cleaning. The case is open at top and bottom, producing a chimney-like effect which pulls air through the coils for continuous cooling.

The improved commutating rheostats can be furnished for ¼, ½, 1, and 5 ampere step regulation in required capacities. Descriptive literature mailed promptly on request.

Corrosion-Resistant Heat Exchanger

Heil Process Equip. Co., Dept. MF, 12901 Elmwood Ave., Cleveland 11, O.

The new No. 1251 Heil Heat Exchanger has been developed to meet the demand for an economical external type heat exchanger for heating corrosive solutions in the finishing industry.



This double-pipe exchanger makes possible added space in the plating tank in addition to more even distribution of heated solution and constant circulation.

Engineered in a wide variety of complete "package" standard units, the No. 1251 Heat Exchanger is easy to install and requires a minimum of time and labor for conversion from present setup or for new installation.

Heating and cooling can be accomplished with the same unit, eliminating the necessity of separate units. Tube materials available in standard designs include Nocordal impervious graphite, nickel, stainless steel, carbon steel, and Carpenter 20. This makes possible wide application in practically all corrosive solutions and complete interchangeability of tubes.

A great degree of flexibility of control is possible with the No. 1251 Heat Exchanger. An installation includes either a one-tube unit or a series of one-tube units. These units can be individually controlled to give additional economy.

Rust Inhibitor

Crown Industrial Products Co., Dept. MF, Park and Borden Ave., Sycamore, Ill.

This firm announces the addition of a new product to their line. Labeled Crown Rust Inhibitor, this product has been especially formulated to give rust protection to precision parts—work in process, material in inventory and in shipment.

This material is claimed to have the following advantages:

1. It will effectively inhibit rust for six months to over a year.
2. Ease of application.
3. It is not a Plastic!
4. It can be applied to a wet, damp or moist surface and still be effective.
5. It will withstand normal handling —dries to a tacky finish.
6. It is non-toxic and non-inflamable.

Cold Cement for Reheading Polishing Wheels and Abrasive Belts

Schaffner Manufacturing Co., Inc., Dept. MF, Emsworth, Pittsburgh 2, Pa.

This firm announces the availability of their new "Grip Grain" Cold Ce-

LEA Copper Glo

with the Ronal High Speed Bright Copper Plating Process*

TOPS in Brightness plus Throwing Power and Plating Speed

We take it that you, as is the case with countless other platers, are interested in getting maximum production from your existing equipment. If your problem is one of obtaining a bright, soft copper with a minimum of tank tie-up time, LEA Copper Glo can solve this in a way you cannot afford to overlook.

LEA Copper Glo gives you brilliance with exceptional speed of deposition and excellent throwing power. Its high speed plating characteristics (Hull cell bright current density range 10-60 amperes/sq. ft. for standard formulations) permits production increases of from 30% to 60%, using existing equipment.

Plating minutes are valuable to you. Check up on Lea Copper Glo by the Ronal Process. In addition to brightness and high current density operation, it offers such added operating advantages as greater throwing power, ductile deposits, elimination of wetting agents and low copper concentrations.

* *The Ronal Bright Copper Process is a development of Ronal Chemicals Inc., Brooklyn, N. Y., for which process patents are pending.*

SAVE NICKEL

• • •

Chrome Plate Directly on LEA Copper-Glo Copper

Burring, Buffing and Polishing . . . Manufacturers and Specialists in the Development of Production Methods, Equipment and Compositions

THE LEA MANUFACTURING CO.
16 Cherry Avenue, Waterbury 20, Conn.
LEA MFG. COMPANY OF CANADA, LTD.
370 Victoria Street, Toronto 2, Canada

ment for polishing wheels and abrasive belts. This product has been previously supplied to a number of manufacturers for test purposes. The new product embodies the results of these tests, and the manufacturers claim it can be used successfully on grains from 20 up to 320 and requires no special preparation to salvage worn out belts or wheels. No heat is required for drying. It is claimed to provide greater efficiency, cuts down time for wheel changes to a minimum, greater adhesive action "locks" emery grain to the surface, and is odorless. Belts and wheels may be reheaded faster with "Grip Grain" and last longer than ordinary glues. Sufficient quantity for testing purposes is available from the manufacturer without cost.

For further information write direct to the manufacturer.

Rubber Masks for Stop-Off Work

Duggan Masking Devices, Dept. MF, 2030 W. Fort St., Detroit 16, N. Y.

Precision molded, snap-on rubber masks developed by this firm have become an important factor in speeding up defense production and cutting costs.

The Duggan method of masking uses precision molded masks of synthetic rubber to cover surfaces of parts that must remain bare after plating or painting. The old obsolete method of masking parts by applying wax or lacquer, then cutting away the coating to expose bare metal is entirely eliminated by the Duggan Masking method.

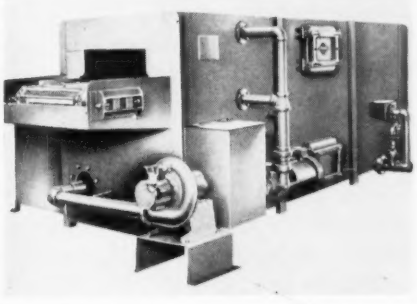
The Duggan mask is quickly slipped on or off, and may be used indefinitely. Saving of time is the primary advantage of this new method, but it has been proven that a higher and more consistent quality is another important result, according to the firm.

The original cost of rubber molds may seem expensive, but actual cost study indicates that once the masks are put to work they will usually pay for themselves within thirty to sixty days. The Duggan method is primarily for production uses.

Duggan Masking Devices hold over twenty-two patents covering masking procedure.

Industrial Washing Machine

Alvey-Ferguson Co., Dept. MF, 75 Disney St., Cincinnati 9, O.



A special washing machine designed and engineered especially for removing sand *mechanically* from steel foundry flasks has been announced by the above company. In contrast with the slow, inefficient method of hand scraping the flasks, this A-F Washing Machine is said to remove the sand quickly and *completely*—most important for close fitting when reassembling the parts of the flasks.

Like all other A-F washing machines for industry, this machine utilizes the A-F Super-Spray cleaning system. The flasks pass along on an A-F bar type conveyor through consecutive high-pressure, fan-shaped curtains of cleaning solution from above, below and both sides until every inch of the flask is free of sand.

A special feature of this A-F Washing Machine is a Slo-Flo Tank (not shown in illustration). The cleaning solution, in re-circulating through the machine, flows very slowly through this tank, as its name implies. In this way the sand settles out of the solution before it reaches the screen tank which screens out foreign particles that might clog the spray nozzles.

This A-F Washing Machine for foundry flasks is claimed to have set

new standards of cleaning speed and quality which result in improved production and reduced costs.

Laminex Fiberglas Tanks

MacDermid, Inc., Dept. MF, Waterbury 20, Conn.

This new tank is made of laminated Fiberglas, the same type material at present being featured in "glass" boats, furniture, fishing rods, and experimental automobile bodies. This new material is extremely durable, lightweight, and has high impact resistance.

Laminex tanks are claimed to be highly resistant to chemical attack inside as well as outside. They are nonconductive, and can withstand freezing as well as boiling temperatures, according to the firm.

These tanks have a smooth white interior that is said not to discolor. Tanks can be equipped with dam overflows and drains. Due to patented method of using matched molds, both interior and exterior have a smooth appearance with uniform wall thickness. The walls are reinforced with vertical ribs molded into the tank. The top rail is made of one inch diameter pipe over which Fiberglas is molded.

Bulletins giving sizes stocked in Waterbury, Conn. and Detroit, Mich. are available by writing.

Synthetic Clear Enamel for Chrome Plate System

Rinshed-Mason Co., Dept. MF, 5935 Milford Ave., Detroit 10, Mich.

A new synthetic clear enamel for use in the protection of chrome plate systems has just been announced by the above firm. Introduced under the trade-name Rust-Chek, the product is presently available in five separate formulas, designed for either high, medium or low baking schedules. Hand spray, electrostatic spray or dipping methods can be accommodated.

The line has been engineered to compensate for the lack of nickel

available for civilian end products such as automotive chrome plate. When Rust-Chek is applied over "scant" chrome plating (minus the usual nickel coat), the plating is given long-term protection from rust and peeling, it is claimed.

All salt-spray and humidity tests of Rust-Chek, as well as year-long Florida exposure tests have proven completely satisfactory, according to the firm.

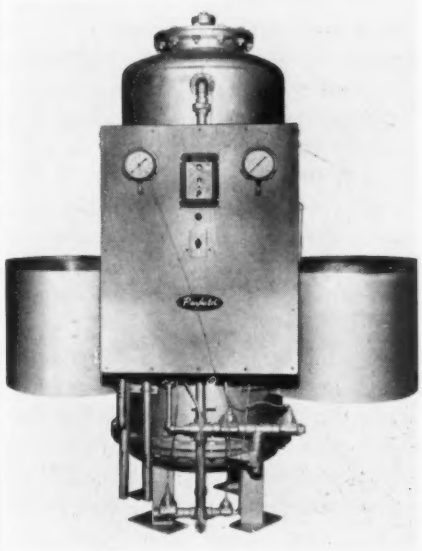
Available on request is a Rinshed-Mason technical bulletin containing all Rust-Chek specifications and recommended chrome cleaning procedures.

Mono-Bed Demineralizer Features Automatic Operation

Penfield Mfg. Co., Dept. MF, 19 High School Ave., Meriden, Conn.

The above company has announced the addition to its demineralizing equipment line of a new fully automatic Mono-Bed Unit.

This new Penfield demineralizer per-



forms all its operating functions, including the regeneration cycle, completely automatically. There are no valves to operate and no supervision is required. Whenever the effluent's conductivity falls below standard, the treated water is automatically discharged and lights (or other warning system) signal the need for activation of a regeneration cycle.

The simple turning of a single switch then puts the unit through its regeneration cycle completely automatically, including rinsing and recutting in the effluent when desired resistivity (purity) is reached. During this automatic regeneration cycle, the regenerative tanks are automatic-

ally refilled with water so that fresh acid and caustics may be added in preparation for the next regeneration cycle.

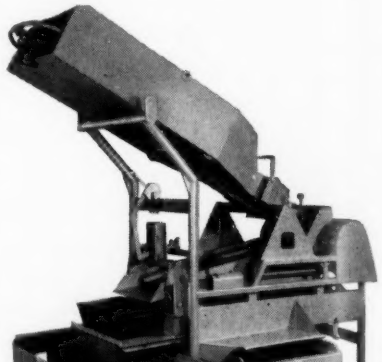
This new Penfield Mono-Bed Demineralizer, in addition to employing the most effective ion exchange technique available to industry (cation and exceptionally strong anion resins intimately mixed in a single unit tank through which the raw water passes only once), also provides the advantages of completely automatic operation. Costly and time-consuming errors that occur in the manual operation of regeneration cycles are avoided, desired high purity of the effluent is an automatic certainty, and operating costs are cut to a minimum, according to the firm.

Available in flow rates from a few gallons per hour to 5,000 gallons per hour and up, the new automatic Demineralizer requires no steam power, operates for a chemical cost of only pennies per 1,000 gallons of treated water, and is said to provide an effluent and a mineral content of virtually zero (resistances have been reported as high as 20,000,000 ohms per centimeter).

Complete catalog information on Penfield's full line of Mono-Bed and Multi-Bed Demineralizing equipment, including the above-described new fully automatic unit, is available.

Parts and Chips Separator and Chip Grader

Grav-i-Flo Corp., Dept. MF, 400 Norwood Ave., Sturgis, Mich.



A new separator for more effective removal of parts from deburring and finishing chips, and for grading different sizes of chips is now being offered by the above firm.

The new design of the machine offers three improvements: 1. Greater compactness is attained by locating the hopper at the top of the machine. Floor space is cut by ½. Area occupied by the new machine is only 3′ x 6′ and with pans only 3′ x 8′. 2. Separation of parts is effected without any danger of impingement to the parts. 3. The two deck carriage permits grading three sizes of chips at one time.

The inclined end of the screen carriage is motivated by an eccentric, while the lower end rests on ball bearing rollers. The eccentric action or throw of the screen is blended into a smooth backward and forward motion at the point of separation of the parts from the chips.

The machine is quickly converted to chip grading by the simple turn of a cam, which raises the lower end of the carriage off its rollers, and creates the same eccentric action as is performed at the back of the machine. The result is a uniform throw over the entire length of the two deck screen carriage, permitting an accurate grading of chips. Screen sizes for various sizes of chips are available.

Of all welded steel construction, the new Grav-i-Flo separator is powered with a ¾ h.p. variable speed drive.

For complete information about the new Grav-i-Flo separator write for catalog.

Film on Barrel Plating

F. B. Stevens, Inc., Dept. MF, Detroit 16, Mich.

A 20-minute sound film showing both processing features and materials handling applications of the famed Stevens Full Automatic barrel plating machine has been prepared and is now offered for showing to interested groups through local representatives of Frederic B. Stevens, Inc.

The film presents a graphic example of the effectiveness of Stevens Automatic Barrel Plating Machines as vital links in high speed production operations. Views taken in a customer's plant show Stevens units as part of a completely automatic material handling and processing installation. Step-by-step analysis of the entire operating cycle is made during the film to show by actual demonstration just what Stevens machines can do to speed flow and processing of work.

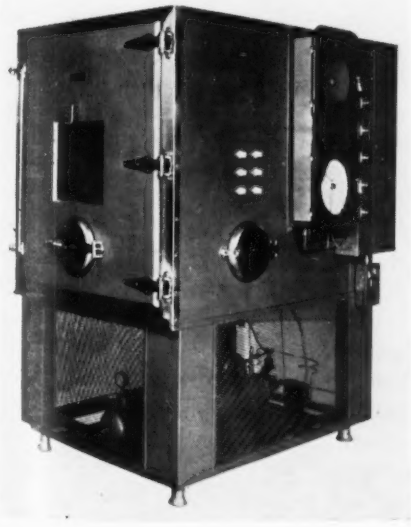
Arrangements for showings to your plant engineers, your trade association, club, school or professional group can be made with nearby Stevens representatives or directly through F. B. Stevens, Inc., Detroit 16, Michigan.

Humidity Test Cabinet

Murphy & Miller, Dept. MF, 1326 S. Michigan Ave., Chicago, Ill.

A new humidity testing cabinet with a 27 cu. ft. working area recently introduced by the above firm will supply relative humidity between 20% and 95% in the temperature range +35°F. to +185°F.

Among the advantages claimed for the new unit by the manufacturer are faster temperature regulation throughout the range, and the elimination of troublesome and damaging condensation caused by changing temperatures during the course of a test.



Fast, accurate temperature regulation is assured through the use of a hermetically sealed refrigeration unit and an electric heating system, which quickly lower or raise interior temperatures to the precise degree required. Condensation is eliminated through the use of a high capacity condensing system, which in effect, anticipates and prevents the forming of condensation on the equipment being tested.

A glass viewing panel with built-in wiper, two conveniently located stainless steel hand hole ports, vapor-proof interior light, forced air circulation, adjustable shelf brackets in the stainless steel working space are standard features of the unit. In addition, 6 electrical leads are introduced into the working space of the unit to provide quick, easy connections to electrical equipment which may be under test. Switches for circuits controlling temperature and humidity are mounted on an externally locked control panel with pilot lights for each circuit.

Optional equipment includes a time schedule control system which will pre-set-dry and wet bulb temperatures and thereby vary the relative humidity progressively to any desired sequence.

Antiseptic Hand Creams

West Disinfecting Co., Dept. MF, 42-16 West St., L. I. City 1, N. Y.

A new line of antiseptic protective creams has been introduced by the above company.

Containing Hexachlorophene (U. S. Patent No. 2535077) these creams provide a "zone of inhibitation" against Staphylococcus aureus, and are so formulated as to be almost neutral in pH, thus assuring against irritations from free acids or alkalis.

The new creams, packed in attractive 12 oz. tubes for easy, sanitary handling are: No. 211, an oil resistant, water soluble bland vanishing cream for protection against dust-borne irritants, viscous oils, dirts, greases and grimes; No. 311, a water-resistant soft cold cream for protection against dilute acids and alkalis; and No. 411, a solvent-resistant water soluble bland vanishing cream for protection against organic solvents, acetates and cooling and cutting oils of low water content. The incorporation of bacteriostatic properties in protective creams has been worked on by the company for considerable time, and it is believed that West is one of the first manufacturers to introduce this type of product.

In order to ensure the most economical use of these protective creams, West has designed the Liquicreme Dispenser. Manufactured of sturdy polystyrene, the Liquicreme Dispenser is designed to dispense a pre-determined amount of protective cream with each stroke of the lever. This unit contains an inner collapsable polyethylene bag which affords complete protection for the antiseptic cream, ensuring against contamination from foreign dirts, dusts and soils. No working part comes in contact with the contents of this dispenser which is built to provide continued, uninterrupted service.

The Liquecreme Dispenser assures against waste by excessive use or spillage. It is easy to install and maintain, and because it provides for the economical use of West's antiseptic protective creams, it pays for itself many times over.

An attractive brochure on West's Antiseptic Protective Creams and the Liquicreme Dispenser may be had by writing.

Dust and Splash Goggle

Fendall Company, Dept. MF, 4631 N. Western Ave., Chicago 25, Ill.

A new Dust and Splash Goggle is included in the line of Cup-type goggles recently introduced by this company, manufacturers of head and eye protection equipment. Known specifically as style No. 501, the new goggle is said to be ideal for use in chemical and other industries where splashing liquids, harmful dusts etc., are handled or processed. Indirect ventilation is obtained through baffled, two-piece construction, anodized aluminum side-shields. Permits ample air circulation, but prevents the entrance of dust or splashing liquids. Perfect facial fit increases safety factor by eliminating gaps or openings, it is claimed. Company officials emphasize the comfort design and pressure-free fit of the eye-cups, with each cup individually molded to conform to both right and

left eye areas of the face, with smooth wide-bearing facial contact surfaces that evenly distribute the weight for added comfort. Cups are molded of acetate-butyrate and are unaffected by moisture or perspiration. Equipped with ball-chain nose bridge, with quick acting lever-type lock for easy adjustment. Lens rings are free-turning, screw type of anodized aluminum for easy lens changing. Long stretch headband is adjustable. A wide range of Fendall protective lenses is also available. Shipments are immediate. New descriptive bulletin and price data may be obtained without obligation.

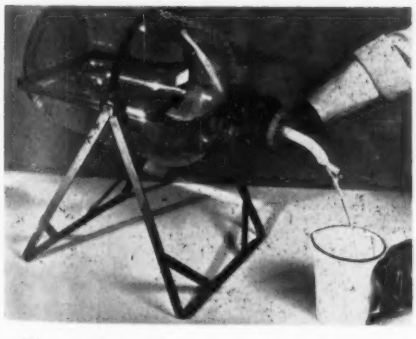
Pouring Liquids Without Spilling or Splashing

General Scientific Equipment Co., Dept. MF, 2700 W. Huntingdon St., Philadelphia 32, Pa.

The GS pouring spout and tilter provides a safe and easy method of pouring liquids into smaller containers.

Built on scientific lines, it is designed to prevent accidents and to save materials, caused by spilling, splashing and carelessness in pouring liquids into smaller containers.

A chain is provided—to hold the bottle in position when tilted. The cradle is made of steel. All members are riveted or welded to insure a strong and durable unit for this purpose.



The safety air vent pouring spout fits any size bottle and assures a smooth even flow without spurts or splashes. This unit is made of a special acid-resistant rubber and plastic tubing for longer life.

Small Parts Finishing System

Cincinnati Cleaning & Finishing Machinery Co., Dept. MF, Schmidt Bldg., Cincinnati, O.

A system which completely finishes 1,440 small parts per hour has been announced by the above firm. The equipment washes, phosphatizes, rinses, and dries the parts, then dip paints, drains and bakes them, returning them to the loading station for unloading by the operator.

Each machine is designed specifically for the parts which are to be finished. One, recently installed, processes voltage regulator covers for one of the largest auto maufacturers. These parts are 3½" long, 2½" wide and 2" deep.

The system is extremely compact, occupying a 20-foot square of floor space and is 10 feet high. It is made as an integral assembly so that it can be moved in the event of plant rearrangement.

In operation, the parts are placed on racks which are attached to the machine's monorail conveyor. The racks, loaded with parts, pass through the washing section where they are washed, phosphate coated and rinsed. After making a 180° turn, the monorail carries them through a glassless infra-red drying oven.

Completely dried, the parts then make another 180° turn on the monorail and are lowered into a paint dip tank. As the parts pass through the paint tank, the rack is tilted slightly to eliminate air bubbles on the inside of the parts. The rack then emerges from the tank, drains for a predetermined length of time and enters the paint drying oven.

The paint drying oven is another glassless infra-red unit which is mount-

ed on top of the washing machine. After the drying is complete, the racks return to the operator at the loading and unloading station. Here the finished parts are removed from the racks and new parts loaded.

To allow for variations in drying time occasioned by temperature or humidity, each oven is wired in four banks. Electrical input and, thus, heat can be varied over a wide range.

The manufacturer expects this unit to find wide application in, for example, electrical manufacturing plants which make or must finish switch boxes, light switch receptacles and similar parts. As a matter of fact, any small part, produced in large quantities can be efficiently processed in this equipment.

All-Purpose Barrel Burnishing Compound

Blue Magic Chemical Specialties Co., Dept. MF, 2135 Margaret St., Philadelphia 24, Pa.

An entirely new barrel burnishing emulsion that is claimed to be a great new advance in lustering compounds has been developed by the above manufacturer. This new product, Blue Magic No. 0-221, has many exclusive advantages never before combined in a single compound. It is claimed to produce a beautiful *hand buffed* appearance in any metal with any tumbling medium and in any standard barrel finishing equipment suitable for wet tumbling. The product may be used repeatedly. It will coat a cutting medium, such as Alundum Tumbling Abrasive and make it a burnishing medium. If lustering is needed, No. 0-221 is said to deliver a finish that is hard to detect from that produced by careful hand buffing.

Blue Magic No. 0-221 mixes readily with water, has no objectionable odor and is not irritating to the skin. It can be removed completely from cutting or other work by a simple water rinse. Free working samples and company laboratory facilities are available for test runs.

Polyethylene Welded Pipe Fittings

American Agile Corp., Dept. MF, P.O. Box 168, Bedford, O.

Agilene (Polyethylene) flanged pipe fittings, such as tees, crosses, 45° and 90° elbows, up to 6" nominal pipe size made throughout of Polyethylene and of fully welded con-struc-

tion are now furnished by the above corporation.

Polyethylene fittings are resistant to most corrosive chemicals and are finding an ever increasing number of applications in various industries. In addition to their use in chemical pipe lines, sewage and waste installations, they are employed in transmission lines for foods and in drinking water and irrigation systems.

Agilene welded and flanged pipe fittings are made to standard dimensions of the American Standard Class 125 Cast Iron Flanged Fittings, and can be incorporated into existing pipe lines. It is recommended that they be used with split sheet metal back-up flanges to avoid deformation of the flanges through bolt pressure.

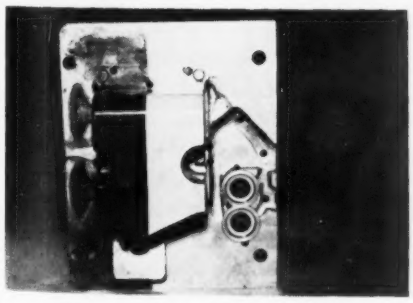
Their extremely light weight permits easy installation and their excellent corrosion resistance guarantees a minimum of maintenance and replacement costs, it is claimed.

For additional information and prices, write to the above address.

Dies Cleaned by Liquid Blast Method

American Wheelabrator & Equipment Corp., Dept. MF, 1150 S. Byrkit St., Mishawaka, Ind.

The accompanying view of an intricate die-casting die shows the effect of liquid blast cleaning. Part of the die was masked off during the cleaning process. Although this die has many deep holes and thin-walled sections, it is easily and safely cleaned. The abrasive nozzle used in this application makes a concentrated stream for penetrating into the smallest holes



and recesses. Wet blasting affords such close abrasion control (tolerances up to .0001 inch are regularly held) that thin-walled sections are not subject to damage. Very fine mesh abrasives are employed. The die illustrated was cleaned in the recently-introduced Liquamatte, a wet blasting machine incorporating important features for easier and less expensive cleaning.

De-Humidifier Protects Stored Steel Against Rusting

Pittsburgh Lectrodryer Corp., Dept. MF, Pittsburgh 26, Pa.

Eleven months ago, several coils of highly polished, completely degreased carbon steel were placed in the store room at *The Kenilworth Steel Co.*, as an experiment. Under ordinary conditions, the steel would have started to rust and oxidize within 24 hours, but without oiling or any other treatment, this steel is still as bright and clean as the day it was put on the shelf.

A *Pittsburgh Lectrodryer Corp.* dehumidifier, which holds relative humidity in the store room to 40%, did the trick. According to *R. T. Connelly*, plant manager of the steel specialty firm a conservative estimate of saving in tangible factors such as labor, oil and inspections, would be $2,000 a year. In addition, intangible factors of care and worry over pre-storage and periodic in-storage oiling and inspections have been eliminated.

Prior to installing the Lectrodryer, Kenilworth inspected incoming steel for signs of rust and either oiled or greased the steel before it was put in storage. During the storage period the highly perishable stocks of shim steel, feeler gauge stock and tempered spring steel were periodically oiled and inspected.

By eliminating these steps, the firm finds its storage area is cleaner and plant housekeeping is less of a problem. Oiling and inspection is done only once, just before the steel is shipped.

In spite of the fact that store room walls and doors were not sealed, the Lectrodryer maintains a 40% constant relative humidity.

Airless Rotoblast Barrel

Pangborn Corp., Dept. MF, Hagerstown, Md.

This firm announces its new airless Rotoblast Barrel designed to increase production and lower costs while maintaining high cleaning efficiency. Two sizes are available in the new line, 6 and 12 cubic foot capacity. Others will be added later.

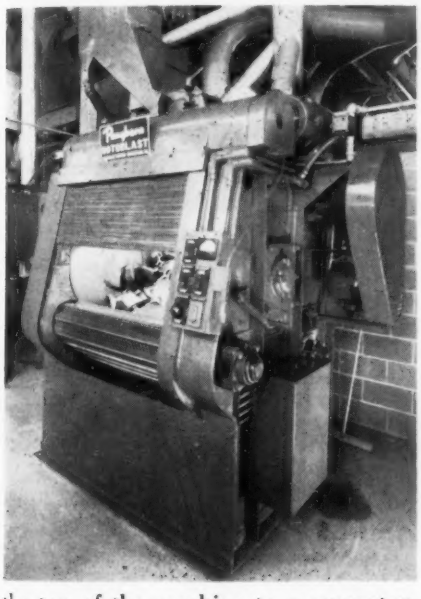
The new barrel, designated as Type GN, has several features aimed at improving cleaning operations while reducing abrasive loss. A newly-designed work conveyor is driven by a hardened steel chain and uses special cast ductile iron slats which will not pinch the work. The conveyor slats turn on the pitch line of the sprockets and the distance between slats is always the same at any point in travel. This prevents passage of wire or chill nails into the track of the chain where operation could be affected.

Drive is by means of V-belts to a spur gear reducer mounted directly on the work conveyor shaft. When the barrel is operating, the conveyor travels upward to tumble the castins. After the cleaning operation, direction of the conveyor is reversed and the load is discharged into the work loader. Conveyor take-up is located on the bottom shaft where weight of the conveyor makes it easier to adjust. An automatic throw-out torque arm disengages barrel drive in case of jams. It works in both loading and unloading directions.

An abrasive-tight door and housing have been developed to retain abrasive

within the machine and permit economical use of new types of abrasives. The door is woven wire mesh backed with vulcanized rubber and slides on rollers in a mechanized labyrinth. It rolls up compactly out of the way as it is opened permitting easy access to the cleaning chamber. A crank actuates the door and it can be held at any position by a positive brake. It is expected that the rubber facing on the door will mean a considerable decrease in wear and maintenance.

During barrel operation, the cleaning and reclaiming system is constantly at work removing all sand and debris and maintaining the full efficiency of the abrasive. A rotary scalper wheel scalps off large fragments, leaving the abrasive which drop through a screen. Abrasive is conveyed up to



the top of the machine to a separator. At this point sand and spent abrasive are drawn out of the machine and good abrasive drops down to a storage container to be re-used. Volume of abrasive flow is controlled by an orifice plate.

A quick-acting work loader, with double cables for safety, positively delivers the entire load into the machine. Control panel has been conveniently located alongside the cleaning chamber opening and push buttons are used.

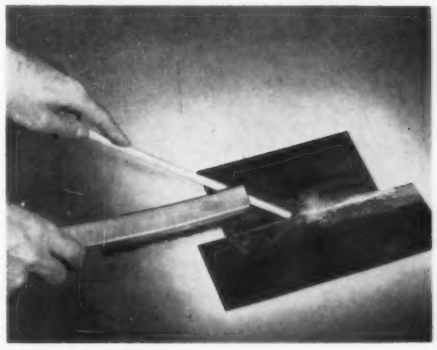
Drive motor for the unit is 1½hp. The 6 cu. ft. unit is 6 ft. 8 in. deep by 6 ft. wide and 13 ft. 9⅞ in. high. The 12 cu. ft. unit is 7 ft. 9 in. deep by 9 ft. 7 in. wide and 14 ft. 6 in. high.

Further information may be obtained by writing, on your company letterhead, to the manufacturer at the above address.

Re-Galvanizing Welded Seams on Galvanized Sheet Metal

Metalloy Products Co., Dept. MF, 1351 East 17th St., Los Angeles 21, Calif.

The above company, distributors of Galvalloy, the galvanizing coating bar that solves an important problem for



Welders—announce they have reduced the bar length from 16" to 14" in length, thereby making the bar easier to use, as well as reducing the possibility of breakage.

Galvalloy is claimed to bond to any metal without the use of flux; merely rub it on the pre-heated surface and it will bond to such an extent that it cannot be burned off even though the base metal is heated to a cherry red.

Galvalloy is being used in every phase of industry where galvanized metal is fabricated.

Bright Gold Process

Sel-Rex Precious Metals, Inc., Dept. MF, 229 Main St., Belleville, N. J.

The Sel-Rex Bright Gold Process (Patent Applied For) is designed

primarily for deposition of gold where thicknesses of .0001″ to .004″ thick and higher are desired. The bath is made up and maintained by specially prepared salts and brighteners. The process is claimed to produce mirror-bright, relatively hard gold deposits regardless of whether the deposit is .000001″ or .001″ thick.

The materials used for the plating bath are Potassium Cyanide, Sel-Rex Bright Gold "B"-1 (bath make-up salts), and Sel-Rex Bright Gold "M"-2 ((bath maintenance salts). Anodes can be platinum or No. 316 Stainless steel. The Plating tank can be made of Pyrex glass, Fibreglass, stoneware, Lucite, stainless steel or rubber-lined steel.

In most installations it is essential that moderate-to-rapid agitation be obtained in order to secure maximum brightness.

The bath is made up by dissolving the prepared gold concentrate, containing the necessary brighteners, in a solution of potassium cyanide. The metallic gold content is maintained between 1-2 oz./gal. Operation is at 6-12 a.s.f., higher with higher gold contents. An anode-cathode ratio of 2-1 is used at a temperature of 70-90°F. Cathode efficiency is stated to be 100% over the above c.d. range. Deposition is at the rate of .0001″ in approximately 6 minutes at 6.2 a.s.f.

Complete details and specifications are available on request to the above address.

BUSINESS ITEMS

Steve Martin Joins Storts Welding

Stephen M. Martin has been appointed Mechanical Engineer of *Storts Welding Co.*, Meriden, Conn., as of April 1, 1952.

Among the companies with which he was formerly connected are Western Electric Co., Union Carbide and Carbon Chemical Corp., and United Chromium, Inc. Since 1939 he has been Chief Engineer of the latter concern.

Mr. Martin is a college graduate with the degree of Mechanical Engineer. During his professional career he has been engaged in plant layout and equipment design activities a great deal of the time.

Handy & Harman Promotes Executives

G. H. Niemeyer was re-elected president at the annual meeting of *Handy & Harman*, refiners and fabricators of precious metals.

Judson C. Travis, was elected vice-president and general manager and, was given the additional responsibility for all accounting and financial departments of the company. Therefore, the heads of all company divisions will report directly to him.

Frank C. Jones, Bridgeport plant manager, was elected vice-president in charge of production. *Thomas H. Gallagher*, managing director and treasurer of the company's wholly-owned subsidiary, *Handy & Harman* of Canada, Ltd., was elected to the

Judson C. Travis

Frank C. Jones

board of directors, whose membership was increased from eight to nine.

All other officers and members of the board were re-elected. *C. W. Handy* was re-elected chairman of the board, and other members are as follows: G. H. Niemeyer, J. C. Travis, F. C. Jones, H. W. Boynton, vice-president and treasurer; J. W. Colgan, vice-president in charge of sales; R. H. Leach and H. E. Radix. R. G. Jones was re-named secretary. F. H. Wemple was elected assistant secretary.

Both G. H. Niemeyer and J. C. Travis began as office boys with the company. The president this year completes 52 years with Handy & Harman. Travis started in 1918 and became executive vice-president in 1950.

F. C. Jones went to Bridgeport as plant manager in 1941, after six years in sales. In his position as vice-president, he will direct all manufacturing operations, research and metallurgy.

T. H. Gallagher has been manager of the Canadian subsidiary since 1941. Prior to that he was in charge of sales in the Chicago territory. He started with Handy & Harman in 1928 in the New York plant.

British Phosphate Process Now Available in U. S.

Jenolite, an amazing British metal pre-treatment discovery, is now available in this country exclusively through the *Eastern Jenolite Distributing Co.*, of Cleveland, O. Now being widely used in England by the War Office, the Air Ministry, the Ministry of Supply and the Ministry of Works, Jenolite is said to have the unique faculty of derusting, de-scaling, phosphating, rust-proofing and keying metal surfaces for paint adhesion all in one operation.

Jenolite can be applied to metal or metal components by dipping, spraying or brushing. When Jenolite pretreatment is employed it is unnecessary to neutralize the surface. Components treated in Jenolite are thoroughly rust-proofed and reoxidation is prevented for a considerable length of time. Due to the fine crystalline surface provided by Jenolite, good paint adhesion is assured; a minimum quantity of paint is required. In addition, Jenolite is economical and does not require highly skilled labor in its application.

Jenolite supersedes present methods of pickling, sand blasting or wire brushing. For a finish that will withstand all conditions of travel or climate, fabricated metals and metal components can be Jenolized as outlined above and finished according to specifications (i.e. paint, plating, galvanizing, baked enamel, vitreous enameling, etc.) When a primer coat is specified, the best results are obtained by using Jenolite Chemical Sealer, which has been chemically developed to give the best results with Jenolite.

Wyandotte Chemicals Opens Buffalo Office

Effective June 2, Wyandotte Chemicals moves its office from Syracuse to *541 Seneca St., Buffalo 4*, in order to be more centrally located in the territory. *G. Millard Whitney*, district

sales manager for the *J. B. Ford Div.* of the Wyandotte organization heads a force of trained specialists in all branches of commercial cleaning and sanitation—metal cleaning, laundering, dishwashing, dairy and beverage plant sanitation, maintenance cleaning and germicidal operations.

United Chromium Advances Men in Engineering

W. S. Cibulskis

Two men have been appointed to new positions in the Engineering Department of *United Chromium*. *Walter S. Cibulskis* has been named Chief of Engineering, and *Frederick G. Bauer* has been made Manager of Engineering.

Mr. Cibulskis, a member of the United Chromium organization for nearly fifteen years, is well known in the plating field. Prior to this advancement, he served as Development Engineer, supervising the initial field installations and operations of new electrolytic and chemical metal finishing processes of the company's research laboratories. He also carried out special engineering assignments, particularly in porous chromium plating. In his new capacity, he will be in charge of the engineering activities of the company.

Mr. Cibulskis, a graduate of Rensselaer Polytechnic Institute, has been associated with the plating industry since 1938 when he went to work in the laboratories of United Chromium at Waterbury, Conn. In 1941 he was transferred to the Detroit office of the company as a Service Engineer. As Chief of Engineering, Mr. Cibulskis' new headquarters are at the company executive offices at 100 East 42nd Street, New York City.

Frederick G. Bauer, formerly company Mechanical Engineer, is the new Manager of Engineering. Before joining United Chromium in 1946, he was active in the mechanical engineering field, and served as a major during World War II with the New York Ordnance District.

Mr. Bauer, who is a graduate of New York University, helped design

F. G. Bauer

the United Chromium organic coatings plant at Carteret, N. J. He also cooperated in the designing of the Unichrome 16" and 24" Batch-Type chromium plating barrels and also the new Unichrome tantalum heating and cooling coils and heat exchangers. Mr. Bauer also is located in the New York executive offices of the company.

J. Holland & Sons Plant Expansion

J. Holland & Sons, Inc., manufacturers and distributors of metal finishing equipment, Brooklyn, N. Y., announce the expanding of plant facilities in a new three-floor steel and reinforced concrete fireproof building at *45 Johnson Ave.*, in the heart of industrial Brooklyn. The new plant will be a short distance from their present address at 276 South 9th St., Brooklyn.

An ultra-modern building designed by *Mr. Saul Goldsmith*, noted Brooklyn engineer and architect, it will afford J. Holland & Sons, Inc. 60,000 square feet of extra space to house additional factory equipment and executive offices. According to *Mr. Charles Holland*, President, the expansion will enable the firm to keep one step ahead in the latest developments in research and new product design for metal finishing equipment. Facili-

ties for distributing the finest in finishing equipment will also be expanded. The new building will be ready for occupancy within a few months.

D. J. Murray, Tumbling Machine Firm, Expands

An addition of 37,000 square feet to their present plant was started recently by *D. J. Murray Manufacturing Co.*, Wausau, Wisconsin. Completion is scheduled for September. Face brick to conform to the brick in the present building will be used for this new addition that when completed with the present building under a single roof will have a 350-foot frontage on Third Street, one of Wausau's principal business streets, and a 240-foot frontage on Fulton Street.

The additional plant facilities will make it possible for D. J. Murray Manufacturing Co. to increase its number of employees that now total 400, including employees in foundries, machine shops and other departments.

Costume Jewelry Industry Aided by Small Business Hardship Account

The costume jewelry industry in New England will be helped considerably by supplemental allotments of controlled materials from the Small Business Hardship Account, it was announced recently by the National Production Authority, Department of Commerce.

The applications of 23 producers of jewelers findings in the Providence, R. I.-Attleboro, Mass., area for additional controlled materials have been approved by the Small Business Hardship Account Review Panel. In turn, these producers supply costume jewelry manufacturers with the component parts that go into pins, earrings, clips and other metal ornaments.

The applications were predominately for copper brass mill products and were granted in order to prevent failure or prolonged shutdown among the producers.

Huntley New President for Cowles Chemical Company

Robert F. Huntley

Mr. Robert F. Huntley was elected president of *Cowles Chemical Company* at the organizational meeting of company directors held April 8. Mr. Huntley succeeds *Mr. Edwin Cowles*, who continues as a director.

Mr. Huntley came with Cowles in July, 1942, as assistant to the president, after serving as technical director for the Sealright Co., Inc. In September, 1942, he was elected to the board of directors and appointed vice president and general manager. In his new post, President Huntley will continue with the duties of general manager.

The stockholders at their annual meeting earlier in the day re-elected *Mr. Huntley*, *Mr. Cowles*, *Mr. C. C. Bassett* and *Mr. C. B. Lansing* to the board of directors. *Mr. David A. Gaskill* was elected to succeed *Mr. E. S. Bassett*, who is retiring.

Raybestos-Manhattan Appoints New Sales Manager

Appointment of *Harold H. Burrows* as Sales Manager of the Industrial Rubber Goods Sales Div., Raybestos-Manhattan, Inc. has been announced by the company's executive offices at Passaic, N. J.

Mr. Burrows has had wide experience in the rubber industry over a period of many years. After serving for several years as assistant manager of the Roll and Tank Departments, he became manager of those departments in 1942. He has many industrial friends, particularly in the paper, textile and chemical processing industries.

Charles P. McHugh has been appointed manager of the Roll Covering and Tank Lining Production Depts. of Manhattan Rubber Div., Passaic, N. J.

New NEMA Standards for Metallic Rectifiers

A recent bulletin of the *National Electrical Manufacturers Association* (NEMA) lists a number of changes in their specifications for metallic rectifiers. Subjects covered by the revisions are Dimension Nomenclature, Operation, Regulation, Charging Time, Nameplate Marking. Copies are available from the NEMA headquarters *155 East 44th St., New York 17, N. Y.*

Berry Elected President of Electric Products Co.

The Board of Directors of *The Electric Products Co.*, a leading manufacturer of special motors and generators since 1909, announces the election of *Gordon J. Berry* as President. Mr. Berry started at The Electric Products Co. in the early 30's after attending Mercersburg Academy, Cornell and Western Reserve University. Beginning as a test engineer, he progressed through the service organization, design engineering and sales engineering to his recent position of Vice-President in charge of Sales.

Gordon J. Berry

Active for many years in the National Electrical Manufacturers Ass'n., Mr. Berry has also supported and served energetically the Industrial Truck Ass'n. and the Materials Handling Institute. In addition, he is a member of A.I.S.E. and the Cleveland Engineering Society. He is a director of several Ohio concerns, and over a period of years, he has written many papers on special electrical equipment.

Holmes will maintain his office at his present Birmingham location. As Cincinnati's reprsentative, he will handle their complete line of metal cleaning machines and finishing systems.

Southern Representative Appointed by Cincinnati Cleaning Mach. Co.

Appointment of a new representative covering the southern states is announced by *Cincinnati Cleaning and Finishing Machinery Co.*, Ironton, Ohio. *C. E. Holmes*, 831 N. 20th Street, Birmingham, Ala., will represent the company in Alabama, Tennessee, Georgia, Louisiana and Mississippi. He comes to Cincinnati with a background of more than fifteen years in metal cleaning and finishing.

Pennsalt Appoints Blitz Sales Supervisor

Arnold E. Blitz has been appointed *Pennsylvania Salt Manufacturing Co.'s* sales supervisor in the ordnance field, it was announced recently by *Joseph J. Duffy, Jr.*, Sales Manager of the Metal Processing Department.

Mr. Blitz joined Pennsalt as sales-service representative last year when

the company began marketing phosphate coatings and lubricants for application to steel prior to cold working. In his new position, he will supervise the coordination of the company's sales and service with ordnance contractors and will act as liaison between the company and the government on this important phase of the mobilization effort.

A native of Brooklyn, New York, Mr. Blitz attended West Chester State Teachers College in West Chester, Pa. He is a member of the American Ordnance Association. He and his family live in Havertown, Pa.

Valentine Appointed Chicago Branch Manager of Wagner Brothers

Announcement was made by *J. R. Wagner*, President, *Wagner Brothers Inc.*, that *Gilber B. Valentine* has been appointed Branch Manager of the newly established Chicago Office. Wagner Brothers is one of the leading producers of anodes and electroplating rectifiers in the United States.

Mr. Valentine assumes his new position after service with the *McGean Chemical Co.* as Sales Engineer since 1946. Prior to this he was associated with the Cleveland Graphite Bronze Co. from 1938 to 1941. He then served in the U. S. Navy until 1945. Valentine is a chemical engineering graduate, holding a master's degree from the Case Institute of Technology.

Valentine is well known to the field which he will service and has practical experience in plating applications. He will act as the liaison for Wagner's

Gilbert B. Valentine

engineering service in Illinois, Wisconsin, and Iowa, the central distribution point for all Wagner products.

This expansion is in line with Wagner's policy to provide the best possible service to their clients. Branches have been established in the principal industrial areas in the United States.

The Electric Products Co. Appoints S. California Agents

The *Electric Products Co.*, of Cleveland, O. has appointed *Robert A. Young & Company* as their sales and service representatives for Southern California and the state of Arizona.

With offices in Glendale 4, Calif., Robert A. Young & Company will handle all of the industrial lines of The Electric Products Co. . . . electrolytic motor-generators, general-purpose motor-generators, frequency changers, a-c and d-c motors and a-c and d-c generators.

Hooker Appoints H. J. Heesch

Herbert J. Heesch has been made field sales supervisor of *Hooker Electrochemical Co.*, it was announced recently. In his new position, Mr. Heesch will be responsible for coordinating the activities of field salesmen and district sales managers. He will make his headquarters at Niagara Falls.

Clover Appoints E. S. Gilmore

Mr. E. S. Gilmore has been appointed District Sales Representative in New England for *The Clover Mfg. Co.* His headquarters will be near Boston. Formerly associated in a sales capacity with the Minnesota Mining & Manufacturing Co., Mr. Gilmore has spent many years in the coated abrasives industry. Both Mr. Gilmore's experi-

ence and his wide knowledge of abrasive products' application will enable Clover to serve still more effectively the ever-growing number of users in New England of Clover abrasive papers and cloths and lapping and grinding compounds.

Mr. Roger A. B. Heap has been assigned to supervision of sales in the state of Connecticut and Western Massachusetts.

Stepat Joins Barrel Finishing Supply House

Industrial Supplies & Equipment Co. announces the appointment of *Mr. Walter Stepat* as Regional Engineer in Eastern New England. Mr. Stepat replaces *Charles McNally*.

Walter Stepat brings to his new association experience which is of real value to everyone with a metal finishing problem. His five years as Assistant Plant Manager of the *Solvent Chemical Co.* gave him much valuable production experience and his three years with the *DuBois Co.* broadened his knowledge of metal cleaning.

This experience has been supplemented by a training course in the most advanced barrel finishing techniques which he has just completed.

Mr. Stepat's address is 3 Whiteoak Lane, Auburn, Mass. Telephone: AUburn 2673.

McNeilly Elected President of Felt Ass'n.

Mr. Stanley McNeilly, Treasurer of the *Bacon Felt Co.*, of Taunton, Mass., was recently elected president of the *Felt Association*, a group of the leading manufacturers, cutters, and jobbers of wool felt. Mr. McNeilly has been active in the felt field since 1942.

Stanley McNeilly

Costume Jewelry Meeting

In order to maintain production in costume jewelry and employment in distress-classified areas, the *Costume Jewelry Manufacturers Industry Advisory Committee* recommended a substantial increase in third quarter material allotments, especially copper brass mill products, at a meeting with the National Production Authority, Department of Commerce.

Industry members said they could use up to 100 per cent of base period allotments, but that at least a substantial increase in third quarter allotments is necessary to overcome hardships and avoid widespread unemployment.

NPA assured the industry that it could count on roughly the same amount of controlled materials in the last two quarters as it was given in the first two quarters. However, certain shortages must be handled on an individual basis, NPA said, and assistance will be given in the future, as in the past, under supplemental allotments from the Small Business Hardship Account.

NPA warned industry members to expect continued shortages of copper and nickel for civilian items and recommended the use of substitute materials, wherever possible.

The committee reported definite progress in the use of substitutes, with conservation measures taken by such diverse groups as the watch band,

chain and cast metal manufacturers. Several members said the use of substitutes still could not overcome the need for additional metal allotments.

Further industry recommendations focussed on three specific industry problems. The committee recommended:

1. Release of all existing tin inventories, legally acquired previous to controls and held by manufacturers, without the necessity of appeals procedure.

2. A clear interpretation of the listing of insignia as either class "A" or class "B" products.

3. Renewed consideration of import quotas with a view to helping manufacturers to meet the added pressure of imported goods, which are free from controlled material prohibitions.

The committee also suggested further study of a proposed M-order on costume jewelry.

Boyce Starts 20th Presidential Term at D. J. Murray

F. C. Boyce, of Wauwatosa, has been re-elected president of the *D. J. Murray Manufacturing Co.*, of Wausau, Wis., for the 20th consecutive time.

Other officers re-elected are *M. P. McCullough*, of Chicago and *D. C. Everest* of Wausau, vice-presidents; *A. W. Plier*, of Wausau, executive vice-president and general manager; *G. L. Ruder*, of Wausau, treasurer; *W. A. Marquardt* of Wausau, secretary; and *C. L. Durkee* of Wausau, vice-president and sales manager.

Worcester Firm to Make M-1 Rifles

The award of an army ordnance contract in the amount of $11,147,000 to *Harrington and Richardson Arms Co.*, Worcester, Mass., for the manufacture of Garand 30 caliber M1 rifles and spare parts has been announced recently.

Joseph H. Quick, president of the firm said that plans call for subcontracting 65% of the order. Technical data to be used in preparing bids has been made available to 568 small manufacturers in the Worcester area through the cooperation of the Worcester Chamber of Commerce.

Diversey Makes Several Executive Appointments

C. R. Reid

C. R. Reid, for the past three years credit manager of The Diversey Corporation, Chicago, has been promoted to the position of assistant to *W. E. Noyes*, vice-president in charge of sales.

Reid will analyze market potentials in connection with development and promotion of new products.

Reid joined Diversey in 1946 as a credit correspondent. A little more than a year later he was advanced to assistant manager of the department. He was named department manager in 1949.

B. B. Button

B. B. Button, formerly assistant to W. E. Noyes, has been named general sales manager.

When Noyes was named vice-president in charge of sales a year and a half ago, he retained the title of general sales manager, now relinquished to Button. As general sales manager Button assumes responsibility for sales of Diversey's seven divisions in the United States.

Button joined the organization in 1939, working initially on technical development, service and research for the food industries. In 1942, he was promoted to assistant manager of the

newly-formed Metal Industries Department. He was named manager in 1945.

Three years ago Button was named assistant to the general sales manager.

D. V. Hannibal

Donald V. Hannibal, assistant director of Diversey's Technical Development Dept. for the past year, has been named director.

Hannibal joined Diversey in 1947, beginning as a chemist in the Diversey Research Laboratories. At the time of his transfer to the Technical Development Department a year ago, he headed analytical technical service and control for the chemical laboratory, a division of the Diversey Research Laboratories.

R. J. Keller

R. J. Keller, formerly assistant credit manager, has been promoted to credit manager.

Keller has forged steadily ahead through a series of promotions since joining Diversey five years ago. He began as a sales correspondent for the Central Div., subsequently moving into the Credit Dept. as a correspondent. He was named assistant manager in 1950.

Metals Disintegrating Co. Appoints Abrasives Representative

The appointment of *Louis A. Knolke* as sales representative for the *Harrison Abrasive Div.* of *Metals Disintegrating Co., Inc.*, Elizabeth, N. J. and Manchester, N. H., has just been announced.

Mr. Knolke will represent Harrison Chilled Shot and Harrison Diamond Grit in the New Jersey and Pennsylvania area. Mr. Knolke will be available for consultation on all types of problems concerned with the use of metal abrasives.

Burt Mfg. Company Celebrates 50th Anniversary

Founded 62 years ago, in 1890, *The Burt Mfg. Co.*, Akron, Ohio, celebrated its Golden Anniversary of incorporation with an Open House on May 17th.

One of the country's largest and best equipped manufacturers of roof ventilators, louvers, exhaust heads and sheet metal specialties, Burt acquired, earlier this year, all remaining buildings in its block for the company's expanded manufacturing needs. Remodeling of the entire property will be completed by next year.

Free World Nickel Production Rising—Increase of 65% Over Pre-War is Seen

When current expansion programs are completed, total annual production of nickel in the free world will be roughly 375,000,000 pounds, an increase of 150,000,000 pounds, or more than 65 per cent, above that of the pre-war years, it was disclosed recently by *Dr. John F. Thompson*, Chairman and President of *The International Nickel Company of Canada, Limited*.

In his address, Dr. Thompson stated that Inco is now mining ore at a present annual rate of 12,000,000 to 13,000,000 tons. This compares with the 10,500,000 tons yearly average for World War II. This will insure Inco's ability to maintain the 21,000,000 pounds of monthly nickel production reached at mid-year, 1951, through the installation of emergency facilities.

He said that *Falconbridge Nickel Mines Limited*, Canada's second largest producer, is reported engaged in a program to increase its refined nickel production to 35,000,000 pounds annually. *Sherritt Gordon Mines Limited* has plans for construction of a refinery near Edmonton, Alberta, with an

annual capacity of 17,000,000 pounds of refined nickel. The *Nicaro* nickel project in Cuba is expected to be producing at an annual rate of about 30,000,000 pounds of nickel later this year. A new cobalt, nickel and copper separation plant of *National Lead Co.*, in Missouri, is expected to add further quantities to the world supply. According to trade reports, increased output is also anticipated from the nickel mines in New Caledonia, in the South Pacific.

"When these programs are realized," Dr. Thompson stated, "the total annual production in the free world will be roughly 375,000,000 pounds, an increase of over 150,000,000 pounds, or more than 65 per cent, above the corresponding production of the prewar years.

Hoppe Made Manager of Pyrene Metal Finishing

Frederick G. Hoppe has been named Manager of the Metal Finishing Div. of the *Pyrene Manufacturing Co.*, Newark, N. J., according to *L. E. Eckelmann*, Vice-President.

Hoppe is well known throughout the metal finishing field and especially as a pioneer in making practical applications of chrome plating. He is coauthor with *Benjamin Freeman* of the text book "*Electroplating With Chromium, Copper and Nickel*," which was published by Prentice-Hall, Inc.

Hoppe started his business life as a tool and die maker. For five years he had his own plating shop. He then became factory manager of the *Chromium Corp.*, of Waterbury, Conn., for the period 1924 to 1927. From 1927 to 1932 he was Superintendent of the *National Chromium Corp.*, which he left to join the Pyrene organization. As assistant manager of the Pyrene Metal Finishing Div. he has helped supervise its diversified electrolytic and chemical processes.

New Supply Firm on Long Island

Jerry Alter

Jerry Alter former sales manager for Pesco Plating Supply Co. has recently established *The Brucar Equipment and Supply Co.* — Box 433 — Hempstead, New York.

Jerry has been engaged in supplying equipment to manufacturing and jobbing platers and polishers for over seven years. During this period he has established a fine reputation for dependability, and service.

In continuance of this record, Jerry invites your patronage in his new venture which will include rebuilt as well as new equipment and supplies for the metal finishing industry.

Clover Appoints R. E. Poster Abrasive Sales Engineer

Mr. Theodore R. Treadwell, Sales Manager of the *Clover Manufacturing Co.*, Norwalk, Conn., announces that *Mr. Russell E. Poster* has been appointed abrasive sales engineer. In this capacity Mr. Poster will provide specialized technical and engineering service to both the Company's customers and its distributors. In addition, he has taken over the responsibility for Clover sales of both coated abrasives and lapping and grinding compounds in Fairfield County, Conn.

After graduating from the Pennsylvania Military College and the Gradu-

ate School of Engineering at New York University, Mr. Poster became employed as Chief Project Engineer with Raymond Associates, Inc., New York, N. Y., consultants and production engineers. He has had a considerable background of experience in the coated abrasives field.

During World War II Mr. Poster served as a Captain in the Military Intelligence Division of the United States Army.

Cro-Plate Co. Expands Again

Because of the increasing demand for Pressure-Blast wet-blasting equipment and Cro-Plater electro-plating units, the manufacturing division of the *Cro-Plate Co., Hartford, Conn.* has been expanded to include the entire area of approximately 10,000 square feet at the company's Windsor St. plant. The contract plating division of the organization, which formerly shared factory space with the manufacturing division, has been reduced and transferred to the Cro-Plate Company's East Hartford plant.

Founded in 1946, the Cro-Plate Company has shown a growth record which has earned it a place among the young, vigorous metal-working companies in the New England area. Originally operated as a job plating shop, the company's first venture into the equipment field came in 1947 when

a self-contained electro-plating unit was marketed. This unit—the Cro-Plater—offered manufacturers a simplified method of applying hard chrome to cutting tools and other wear parts in their own shops.

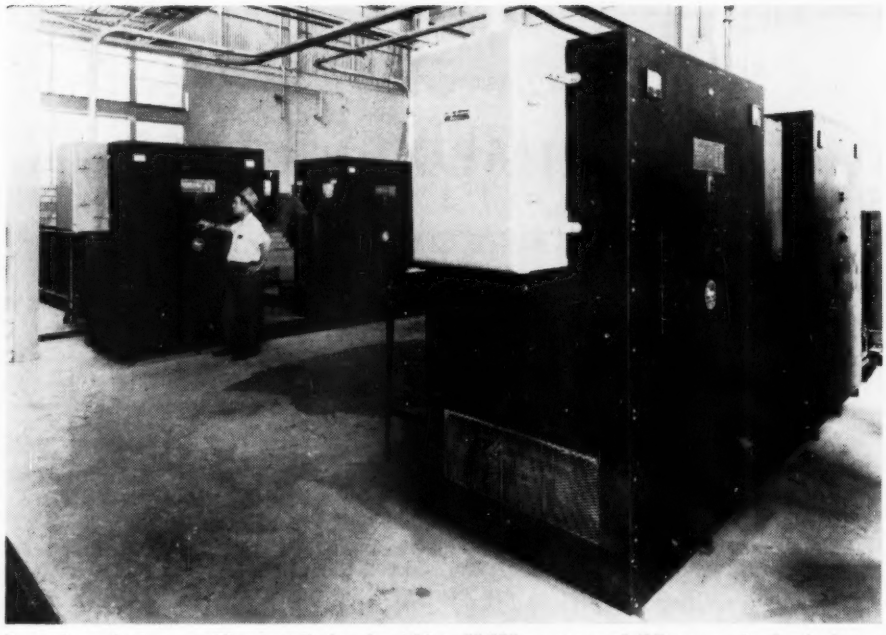
In 1948, the Pressure-Blast wet-blasting units were introduced to the metal-working industry. These units embodied an entirely new principle of high-velocity wet-blasting with the ability to do deburring, descaling and general surface finishing not possible with conventional equipment.

These two products of the Hartford concern are being used widely and to a high degree of success by contractors of such defense items as jet engines, rockets, guided missiles and similar ordnance components.

The Cro-Plate Company also maintains a complete analysis and research laboratory in its East Hartford plant. This division is completely equipped to carry out research on all types of electro-plating with particular emphasis on the application of chrome directly on base metal. Listed among its successful accomplishments is the direct plating of chrome on aluminum. Other important projects presently being carried out are the direct chrome plating of magnesium and titanium, and methods of eliminating the crack pattern in chrome.

Rapid Electric Installs Large Power Units for Gun Barrel Plating

One of the largest rectifier installations for hard chrome plating of naval gun barrels has recently been completed for a large plating plant in the South by *Rapid Electric Co.*, of New York. Saturable reactor controls permit smooth variation of the 60,000 amperes of plating power furnished by the ten rectifiers of this installation. The range of output control is claimed to be unusually wide for saturable reactor regulators—from full load down to 10% of rated load for each rectifier. Another design feature of the rectifier circuits—made necessary by the criti-



Part of a selenium rectifier installation furnishing 60,000 amperes of DC power for hard chrome plating of gun barrels.

cal requirements of this plating process—is a DC output with less than 5% ripple voltage. These specifications were met without sacrificing over-all efficiency, according to Rapid.

It is interesting to note that, by planning the AC ducts and DC bus work in advance, it was found possible to uncrate, install, and put each rectifier into operation the same day it was received.

This application is an example of the trend toward the selenium rectifier as a source of DC power in large amounts. It illustrates, too, the important advantages with regard to ease of installation, simplicity of operation, and reduction of maintenance which the rectifier offers to users of direct current.

Pennsalt Units Win Perfect Safety Awards

Four units of the *Pennsylvania Salt Manufacturing Company* have been awarded *Pennsalt President's Safety Contest* plaques for perfect safety records during 1951 and two of these units also were awarded plaques for the same record by the *National Safety Council*.

The two units which received both awards were the *Cornwells Heights, Pa.*, plant, and the *Whitemarsh Research Laboratories* at Chestnut Hill. The other two winners were the public utility subsidiaries at Natrona, Pa., considered as one unit, and the Montgomery, Ala., neither of which was eligible for the National Safety Council award.

With the exception of the Montgomery plant, which started early in 1951, all of these units have records extending back more than a year. The Natrona Utilities have completed five years without a lost time accident; the Cornwells Heights plant nearly

four years, and the Whitemarsh Laboratories two years. Together, these four units now have a total of 1,532,230 man hours worked without a lost time accident.

The Pennsalt President's Safety Contest is a company-wide competition. These four units are included in the smaller unit section of the contest. Winner of the 1951 trophy for larger units was the Wyandotte, Mich., plant.

Morelli New Finishing Supt. at Dominion Electric

N. K. Morelli

N. Knute Morelli is now Superintendent of Metal Finishing with the *Dominion Electric Corp.*, of Mansfield, O., one of the largest manufacturers of table top appliances. In the past Mr. Morelli has been associated with Goodyear of Akron, Minnesota Mining Co., and with the Murray Ohio Mfg. Company of Cleveland. Has attended Juniata College, the University of Pittsburgh where he obtained his Bachelor of Science degree in 1938, and the Akron Law School. He is a member of the Cleveland Branch of the A.E.S.

News from California

By Fred A. Herr

The Extension Division of the *University of California* at *Los Aneles* is having exceptional success with the plant visitation phase of its night school course in the *Science and Practice of Electroplating.*

Introduced by Plating Instructor *Mitchell Raskin*, this part of the course calls for visits to job plating shops, manufacturing firm finishing departments and the factories of manufacturers of plating equipment.

Mr. Raskin's theory in expanding the lecturing classroom phase of the course was that group visits to actual shops and plants would provide the members with practical visual knowledge of operations.

Another invaluable asset of Raskin's plan is that the plant owners and superintendents literally become "faculty" members for the night of the visitation by lecturing on the methods of operation and technical reasons for processes and manufacturing techniques. Since these men are, without exception, specialists in their particular field, the value of their cooperation may be estimated.

The class in electroplating is now in its sixth year under Raskin's direction. In that time in excess of 200 members of the Los Angeles area plating industry have attended. The course is designed in the main for men already grounded in the plating techniques but who wish to broaden their knowledge and become up-to-date

on latest developments.

Enrollees have included tank platers and polishing machine operators, as well as shop owners and engineers in the "Phd." bracket. Prominent figures in the industry are invited to lecture before teh class. Such guest lecturers have included *Harold Kroesche* of the *Harshaw Chemical Company; Earl Arnold*, laboratory chief, and *Jack Raskin*, plating division supervisor, *L. H. Butcher Company; Chester Borlet, United Chromium, Inc; Morry Schwartz, Surface Alloys, Inc.; Stuart Krentel, Spence Electroplating Company;* and *John Manning* of the Sund-*mark Supply Company*.

Robert Buchanan, who operated *Buchanan's West Coast Plating Company* in Los Angeles for more than 25 years, died in mid-April of a heart attack, aged 61.

The West Coast plant was acquired May 1 by *Warren Davis*, owner of the *Sleeve Line Manufacturing Company* of Los Angeles, who has re-equipped and converted it into a polishing plant for use on automotive parts and accessories. Davis, who prior to 1947 operated the polishing concession in the *Monarch Plating Company* plant in Los Angeles, reports the installation of new polishing equipment.

Promotion of *John F. Traendly* from Los Angeles sales manager to regional sales manager for West Coast branches of the *Minnesota Mining and Manufacturing Company* of St. Paul, Minn., has been announced. Traendly is in his 25th year with the company, having served in various sales posts in the coated abrasive division. Announcement was also made of the appointment of *J. M. Pitblado* as Los Angeles branch industrial sales manager and methods engineer for the firm's West Coast branches.

The *Metal Finishing Association of Southern California* held open house on the night of April 25 to afford members of the finishing and allied industries an opportunity to inspect the organization's new and larger headquarters.

The new offices, more conveniently located and with greater facilities available to members, are at 3742 West Slauson Avenue, Los Angeles, in a one-story bungalow-type structure. The suite of offices includes a conference room, two offices and a mailing department.

Executive-secretary *H. A. Smith*, *Cranor Richter*, former secretary, now with *Cadmium-Nickel Plating Company*, *Howard Woodward* of the *California Rack Company*, *Earl Coffin*, retired former owner of the *Palace Plating Company*, and *Joe Murray* of *Hard Chrome Plating Company* constituted a welcoming committee which greeted visitors and escorted them through the new headquarters. Some 60 persons composed of association members as well as non-member representatives of the plating and finishing supply fields attended the housewarming celebration, which began at 7 p.m.

Associations and Societies

AMERICAN ELECTROPLATERS' SOCIETY

Twin City Branch

The meeting of the *Twin City Branch* of the *American Electroplaters' Society* met on Monday, May 5th,

1952, at 6:00 in the Lodge Room of the *Covered Wagon* in Minneapolis with 23 persons present.

President Wray Schorr of *Hiawatha Metalcraft, Inc.*, called the meeting to order and introduced *Mr. Ray Ledford* of *Sunbeam Corporation*, Chicago, Ill., president of the *Chicago Branch* and *Mr. Taylor* of the *Permutit Company*, Minneapolis.

The following new members were introduced and welcomed to the Branch: *Eldred Cleare*, Minneapolis Honeywell Regulator Company, *Robert Tepley* and *Warren Johnson*, both of Northwest Airlines, Inc., St. Paul, Min.

Chicago President *Ray Ledford* spoke on the coming convention and urged all members planning on attending the convention to endeaver to obtain their hotel reservations as soon as possible.

Vice-President, *Paul Hesse* of the *Union Brass & Metal Mfg. Co.* announced that additional information on the coming annual *Twin City Branch Party* which will be held on Monday, June 2nd and advised that tickets were being sent out. Mr. Hesse also gave information on the coming A.E.S. convention exhibit and urged all members to make arrangements for their exhibit at once.

Following a short intermission the meeting was turned over to Librarian *George C. Reed* of Minneapolis Honeywell Regulator Company who introduced *Mr. Paulson* of the Permutit Company, N. Y. who spoke on "*Recovery of Metallic Waste.*"

Southeastern Branch

At the April meeting of the Southeastern Branch the following members were elected to serve as officers for the coming year.

President—*M. E. Awtrey*, Simmons Plating Wks., Atlanta, Ga.

1st Vice-Pres.—*E. P. Cofield*, Scripto Mfg. Co., Atlanta, Ga.

2nd. Vice Pres.—*Baynard Smith*, Chattanooga, Tenn.

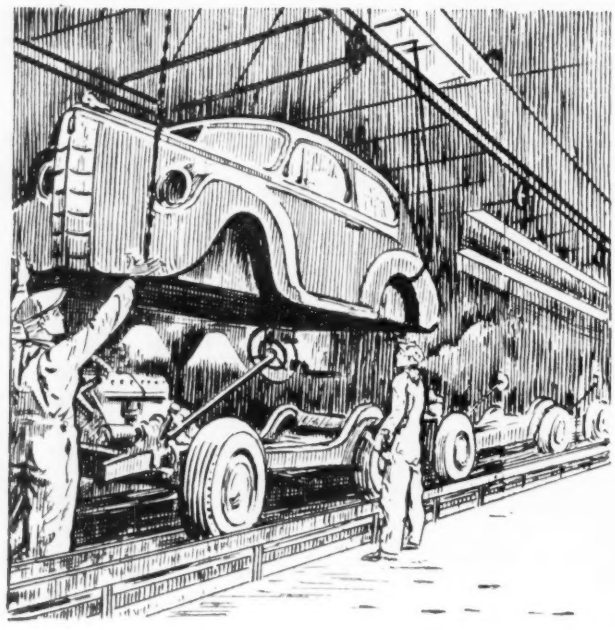
Librarian—*C. H. Hohner*, Udylite Corp., Atlanta, Ga.

Sec'y. & Treas.—*W. T. Weymouth*, Pullman Co., Atlanta, Ga.

New Haven Branch Hears Dr. Goldman

The March meeting of the New Haven Branch was highlighted by a talk by *Dr. Hubert Goldman*, of Enthone, Inc., on "*Barrel Finishing.*" Dr. Goldman has spent much of his time in development work on barrel finishing techniques, and his talk was based on the large amount of data he has accumulated together with many observations on commercial practices. The talk was nicely supplemented by a series of slides showing the results obtained with variations in loading, time, compounds, and other barrel variables.

Dr. Hubert Goldman



MOTOR CITY PLATING NEWS

by

Edward Finne

July 19th is the BIG day in the Detroit platers' summer. That's the day the Detroit branch hosts the boys at the annual Stag Day.

As usual, it will be held at Forest Lake Country Club, the scene of all the previous satisfying and successful parties.

This year's committee consists of:
Charles Conley, General Chairman.
Bob Dudley, Athletics.
Les Borchert, Tickets.
Carl Durbin, Prizes.
Fred Wagner, Entertainment.
Walter Pinner, Advisory.

Tickets for a bang-up day can be obtained from *L. C. Borchert*, 9120 Roselawn, Detroit 4, Mich. for $6.00

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- Entirely Different Type of Alkaline Etching Compound for All Aluminum Alloys
- *ELIMINATES SLUDGE AND CEMENT-LIKE SCALE FORMATIONS ON TANK AND COILS*
- ASSURES UNIFORM ETCHED SURFACE WITH A DIFFUSED REFLECTION AND A FINE, EVEN APPEARANCE
- PROVIDES THE ONLY KNOWN METHOD OF CONTROL TO DETERMINE BATH LIFE

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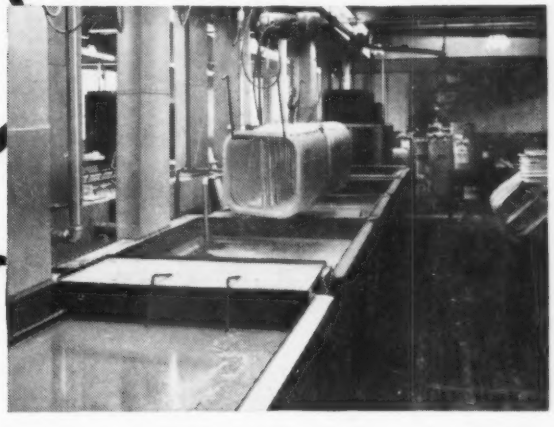

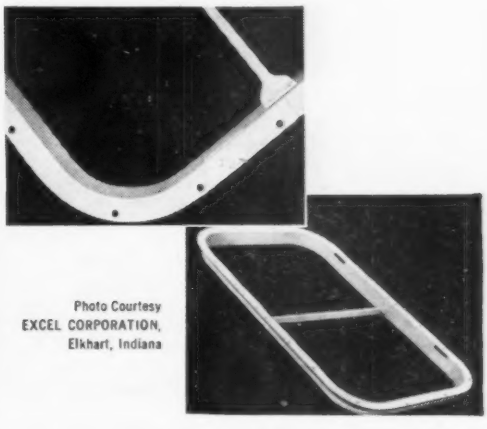

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each. Make checks payable to American Electroplaters Society, Detroit branch.

****

The Washington office of the *National Association of Metal Finishers* is now located at 2117 LeRoy Place, N.W., Washington, 8, D. C.

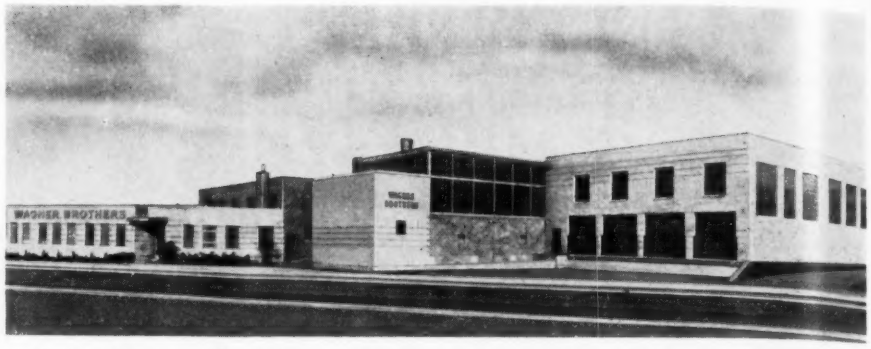
The move has been necessitated by the increasing need for full representation of the organization in the national capitol. *Ray Shock*, executive secretary of the NAMF formerly located in Detroit, is now in residence in Washington.

****

Nielco Laboratories has published Volume 1, Number 1 of a new quarterly magazine titled "Surface Conditioning Topics" and devoted to metal surface conditioning.

Claudius Nielsen, president of Nielco Laboratories and editor of the new publication offers copies of it free to any person interested in any phase of surface conditioning and/or corrosion control. Just send in your request to Surface Conditioning Topics, P.O. Box 4703, Detroit 19, Mich. giving your name, title, firm name and address.

Wagner Bros. Expands its Anode Production Facilities



J. R. Wagner, President, *Wagner Brothers, Inc.*, Detroit, Mich. announced recently the completion of the new wing which will house additional anode production facilities. This is a continuation of a plant expansion program which began in 1948. Built of structural steel and cinder block, the building is now in production.

Completion of the structure was celebrated by a dinner and entertainment for approximately 1,500 guests. The party was held in the new building before production equipment was moved in.

The new construction is the fourth expansion in as many years. It will more than triple existing production of Flat-Top and Iso-Cast Anodes, according to *Henry Tiedeman*, Works Manager. The new building unit will employ the latest lighting, heating and ventilating equipment to insure maximum worker comfort.

****

Glenn Friedt, president of *United Platers, Inc.* of Detroit, ran afoul of the law on a recent trip to Sweden with the Detroit Board of Commerce.

During a tour of the Stockholm Naval Station, Friedt was innocently taking pictures of a naval training ship while with his fellow travelers. Suddenly a guard came up and arrested him as a suspected Russian espionage agent.

Ignoring protests by board members and their Swedish hosts, Friedt was held 90 minutes for questioning and finally released.

Needless to say, while in Sweden, the touring board members kept their cameras well buried after that episode.

****

The May meeting of the Detroit branch of the A.E.S. was held on Friday, May 2nd at the Hotel Statler.

After the showing of the usual movie *Jack Cooper* of the Boyd-Cooper Co. of Detroit gave an interesting talk on "*Disposal of Plating Room Wastes.*"

The results of the election for branch officers for the coming year are as follows:

President—*Herb Head*, Briggs Mfg. Co.

1st ice-President — *Les Borchert*, Houdaille-Hershey Corp.

2nd Vice-President — *G. Burgess*, Electroplating Service, Inc.

Educational Chairman — *T. Gassen*, Packard Motor Co.

Secretary-Treasurer — *J. Gurski*, Ford Motor Co.

Board of Managers — *E. Steegar*, Harshaw Chemical Co.

Delegates to Convention — *C. F. Nixon*, General Motors Research; *H. Head*, Briggs Mfg. Co.; *Frank Clifton*, G. M. Research.

Convention alternates — *E. Hahn*, Lyon, Inc.; *R. Saltonstall*, Udylite Corp.; *R. Dudley*, United Chromium, Inc.

Refreshments were served after this final meeting of the season.

Manufacturers' Literature

Pipeline Strainers

The V. D. Anderson Co., Dept. MF, 1935 W. 96th St., Cleveland 2, O.

A new 4-page bulletin just off the press describes the complete line of Anderson Self-Cleaning pipeline strainers made in sizes from ¼" to 3". An interesting discussion titled "Value of Sediment Control" points out the numerous pieces of pipeline equipment needing strainer protection. These include steam traps, reducing valves, air tools, pumps, temperature regulators, etc. In addition, the bulletin contains complete specifications and prices on the product. Features discussed by the manufacturer include mesh type Anderson Stainless steel strainer screen, low initial cost, self-cleaning feature when blow-down valve is used, and exceptional life.

For a copy, write for Bulletin 252, Attn. Wm. J. Gleason, Jr., Manager, Steam Specialties Division.

Simplified Cleaning

Kelite Products, Inc., Dept. MF, 1250 North Main St., Los Angeles 12, Calif.

"Scientific Cleaning for Modern Metal Finishing" is the title of an illustrated brochure just published by Kelite Products, Inc., national manufacturer of advanced chemicals for cleaning and processing.

The brochure explains how virtually all cleaning and processing jobs are streamlined through the application of compounds utilizing the principle of Kelite pH Control. Included in the brochure is information on high-speed (one to two minutes) phosphatizing; removal of heat-treat scale by simple immersion in an odorless, non-flammable, non-phenolic liquid; advanced procedure to prepare die-cast parts for plating; information on the removal of carbon, grease, dyes

or gums from aluminum, magnesium, cadmium, copper, zinc, die-cast and ferrous metals by soaking in room temperature solutions. Each of the cleaning or processing techniques described can be achieved through the use of recommended compounds.

The literature discusses twenty-three other difficult cleaning or processing jobs with applications in most phases of the metal finishing and metal working industries.

Requests for free copies will receive prompt handling.

Surface Tension Control

Joseph B. Kushner Plating School, Dept. MF, 115 Broad St., Stroudsburg, Pa.

A new bulletin describing the principle of operation of the Sur-Ten Meter, together with a list of applications, is now available. This simple device, which can be used by the most inexperienced help, is a practical device for measuring and controlling the surface tension of a wide range of industrial solutions, chiefly plating baths and alkaline cleaners. It will give an accurate measurement in a matter of seconds, and can be used right out in the shop. Write for your copy of this informative bulletin.

Lucite Electro-Chemical Equipment

Singleton Co., Dept. MF, 10516 Western Ave., Cleveland 11, O.

The only price schedule offering a simplified formula for estimating costs of H-T Lucite equipment used in electro-chemical processing is now being distributed by the above company. The company is the originator and manufacturer of "Singleton Fusion-Welded H-T Lucite Equipment" exclusively.

Included with the Singleton Price List and transmittal letter are illustrated bulletins detailing the firm's complete line of plating cylinders, tanks, liners, baskets, buckets, trays, cells, etc., all of H-T Lucite. This literature will be mailed free on request.

Dipping Baskets

Hanson-Van Winkle-Munning Co., Dept. MF, Matawan, N. J.

The above firm offers a new bulletin on dipping baskets for use in immersing objects in electrocleaning and electroplating solutions. The bulletin covers 12 standard-style wire baskets and includes 3 tables giving dimensions of 27 round, 7 tray, and 22 rectangular models.

In addition to the complete information on shapes and sizes, the bulletin includes illustrations and tabular material on 4 available wire sizes and 6 different meshes.

A concluding section is devoted to special baskets. These include sheet-metal, rubber-covered, and scrap-anode types. Perforation sizes and dimensions are given for sheet-metal and rubber-covered baskets and 8 different sizes of expanded-metal scrap-anode baskets are tabularized.

A chart indicates when to use steel, brass, aluminum, monel, nickel-chromium, stainless-steel, or rubber-covered baskets for acid dips, alkali cleaners, bright dips, cyanide dips, and etching.

Simplified instructions indicate what information to include to order the correct basket for any given job.

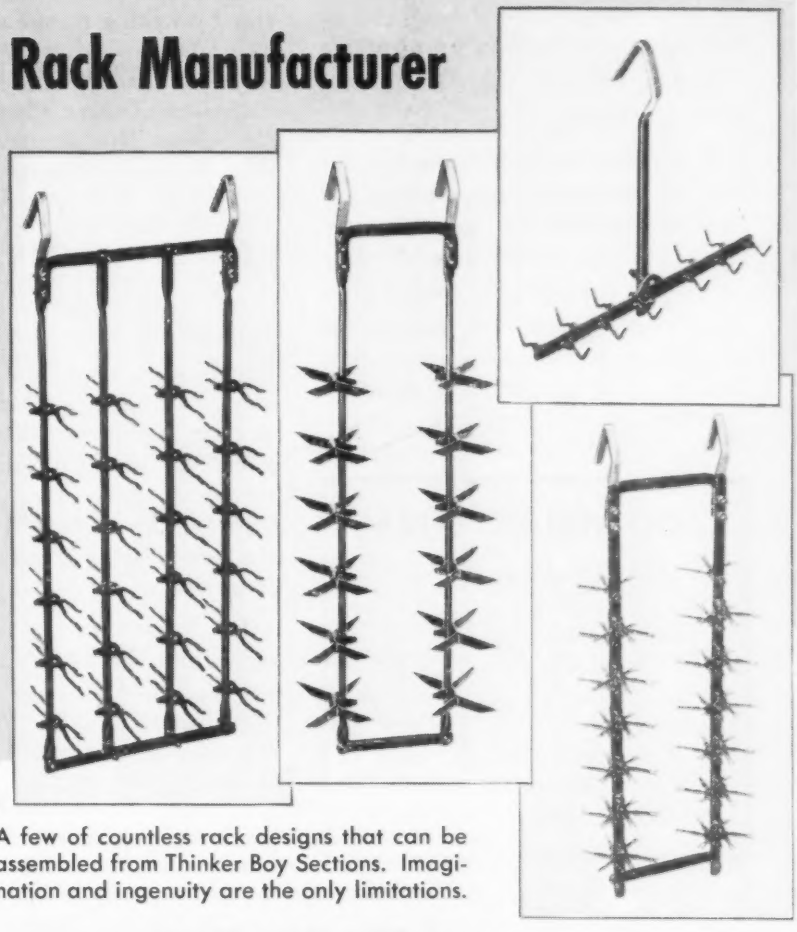
For copies of the Dipping Baskets

Now the World's largest Rack Manufacturer

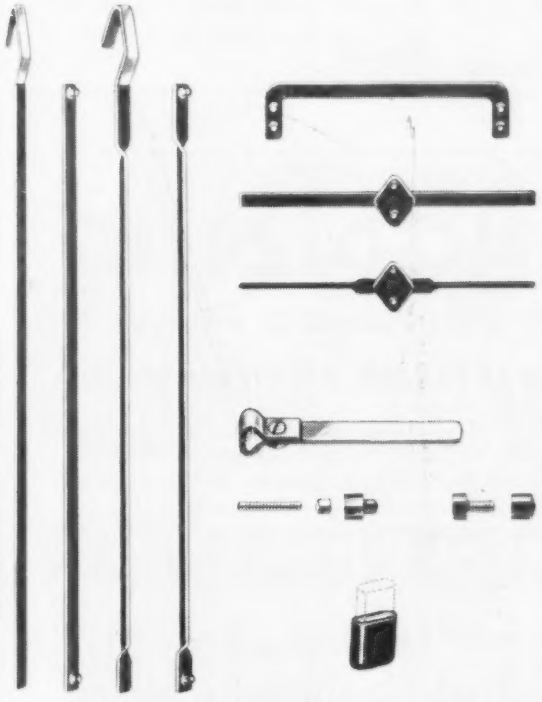
introduces

Thinker Boy Plating Rack Sections

Enable the men who think to make highly efficient racks for any plating job in a matter of minutes



A few of countless rack designs that can be assembled from Thinker Boy Sections. Imagination and ingenuity are the only limitations.



Thinker Boy — preformed rack sections — precoated with BELKE Universal Plastic and equipped with BELKE Vac-Seal Fittings. Assemble with a leakproof seal for quick, economical manufacture of the racks you need when you need them!

NO MORE WAITING!

No more waste and loss from inefficient Racks

Thinker Boy Sections enable you to make the racks you need **when you need them** — genuine, perfectly-formed, universal-plastic-insulated racks with removable tips. Here are a few of the many great advantages —

Efficiency — limited only by imagination and ingenuity.

Complete cleaning and plating with one racking.

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No coating problems — no coating delay.

Endless usability. Parts can be used over and over for racks of different designs. Saves thousands of dollars in rack costs.

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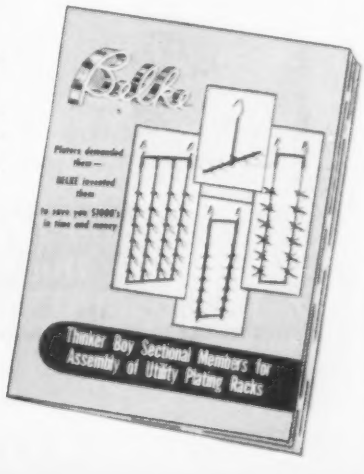
Removable Tips. Hundreds of standard types and sizes.

New Bulletin shows how to make thousands of rack designs with Belke Thinker Boy Sections. Send for your copy NOW.



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bulletin—Bulletin D-108—write to the above address.

Polishing and Buffing Compounds

Roberts Rouge Co., Dept. MF, Stratford, Conn.

This firm, one of the leaders in the field on manufacture of polishing and buffing materials, has recently issued a new bulletin commemorating their 70 years in the field. The booklet gives a history of the firm from its founding in 1881 up to the present time, then follows with a description of the many quality products manufactured by them. Copies of this booklet are available by writing to the above address.

Storing Coated Abrasives

Armour & Co., Coated Abrasives Div., Dept. MF, N. Benton Rd., Alliance, O.

A free new booklet explaining the best way to store coated abrasives in order to prevent deterioration and improve length of service has just been published by Armour and Co.

Since many plants always have large supplies of abrasive belts and discs in their storerooms, this information should be of great interest. Proper storage of abrasives not only reduces deterioration, the booklet explains, but also considerably increases the length of service of any belt or disc.

The booklet makes two important suggestions. First, it is advisable to store coated abrasives in a room where both temperature and humidity can be controlled. Second, it is preferable to store them in the containers in which they are received, and on open shelves. This permits a reasonable circulation of air which will help reduce dampness.

Copies of this booklet may be obtained by writing.

Black Finish for Steel

Mitchell-Bradford Chemical Co., Dept. MF, 2446 Main St., Stratford, Conn.

This firm announces the availability of reprints of an article "*Low Cost Black Oxide Finish Produced on Steel by Chemical Dip Method*," which describes in detail their patented blackening proceses. In addiiton, other

blackening methods, and a browning method, are described. Copies are available from the above address.

Metal Cleaning Folder

E. F. Houghton & Co., Dept. MF, 303 W. Lehigh Ave., Philadelphia 33, Pa.

An inforative, summarized 6-page bulletin on metal cleaning, including concentrations for various cleaning applications and a handy, streamlined list of cleaners for general industrial use, has been released by *E. F. Houghton & Co.*, of Philadelphia, makers of Houghto-Clean and Cerfak metal cleaners.

This bulletin briefly describes the recommended uses of each of Houghton's alkaline, emulsion, acid phosphate and surface active agent types of cleaners. For a free copy of the "Metal Cleaners" folder, write to the above address.

Burnishing Machines

Tumb-L-Matic, Inc. Dept., MF, 4510 Bullard Ave., New York 70, N. Y.

This firm offers a two-color bulletin on burnishing machines for wet-ball burnishing of jewelry and other small metal parts.

The bulletin covers two types of burnishing barrels — conventional wooden barrels made of specially treated hard maple, and molded barrels of high abrasion-resistance material called Tumb-L-Dur. Features of both type tumbling barrels are given, both are illustrated, and a specification table gives sizes and floor space requirements of six different models.

The bulletin covers operating features of both type barrels and in addition gives specific applications of the machines and offers laboratory service to help solve burnishing, precision finishing and deburring problems, and to help select the correct machine for any given job.

Airblast Cabinets

American Wheelabrator & Equipment Corp., Dept. MF, 1179 S. Byrkit St., Mishawaka, Ind.

A new catalog showing the company's line of airblast cabinets in various sizes to serve a range of applications has been published by the above firm. These cabinets are small unit-type machines which are suited for cleaning small lots of work that can be manipulated by hand and the production of which is not large enough to justify more extensive cleaning facilities. These cabinets are available in both suction-type and pressure-type models, and one of the suction-type models can be used where limited space dictates a bench mounting.

A request to American Wheelabrator & Equipment Corp. for Catalog 31-A will bring you a free copy.

Practical Nickel Plating

International Nickel Co., Dept. MF, 67 Wall St., N. Y. 5, N. Y.

A 44-page general publication with over 40 illustrations, tables and charts. Provides the designer, specifying engineer and user with basic information on electroplating and detailed information on nickel plating and its practices.

Keyed bibliography suggests 41 sources of additional reading for those who want greater detail or have special interests. Information on the mechanical properties of deposits, plating conditions and commonly used solutions will be found. Recommendations are made on preparation of basic metals, recognition and correction of plating difficulties and purification of solutions Thickness and type of nickel deposit for adequate service life in many corrosion resistant, industrial and electroforming applications are discussed. Write for your copy.

Small, Portable Drying Ovens

Grieve-Hendry Co., Dept. MF, 1101 N. Paulina St., Chicago 22, Ill.

This firm manufactures a complete line of small drying ovens for laboratory work or individual set-ups in the plant where such a unit will promote efficiency of operations. Sliding drawer

types, as well as swinging door models, are available in a wide range of sizes to meet every industrial need. These units are especially useful for making small quantities of parts after plating, to remove hydrogen embrittlement.

Control of Industrial Dust

Pangborn Corp., Dept. MF, Hagerstown, Md.

This firm offers a 28-page, two-color bulletin entitled "The Control of Industrial Dust." Purpose of the book is to describe Pangborn Dust Control and its many applications. Case histories of users of Pangborn equipment are documented with photographs and performance data indicating savings achieved through the installation of dust control equipment.

Featured in the booklet is the Pangborn "CH" system of control which utilizes cloth type filters for the collection of finely divided dry dusts. A characteristic of this system is high recovery at economical cost. All elements of the system are described and illustrated, with diagrams showing how the entire system operates.

Specifications on sizes and dimensions of Pangborn equipment are listed as well as construction details. Application and engineering data are tabulated according to types of dust, and collection requirements. It is possible to determine the probable requirements for a dust collection system from the engineering tables. However, it is recommended that actual engineering of the system be referred to the Pangborn engineering department.

For copies of this bulletin—Bulletin Number 909A—write to the above address.

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1—2000/1000 Amp., 6/12 V., Munning "Optimus"
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